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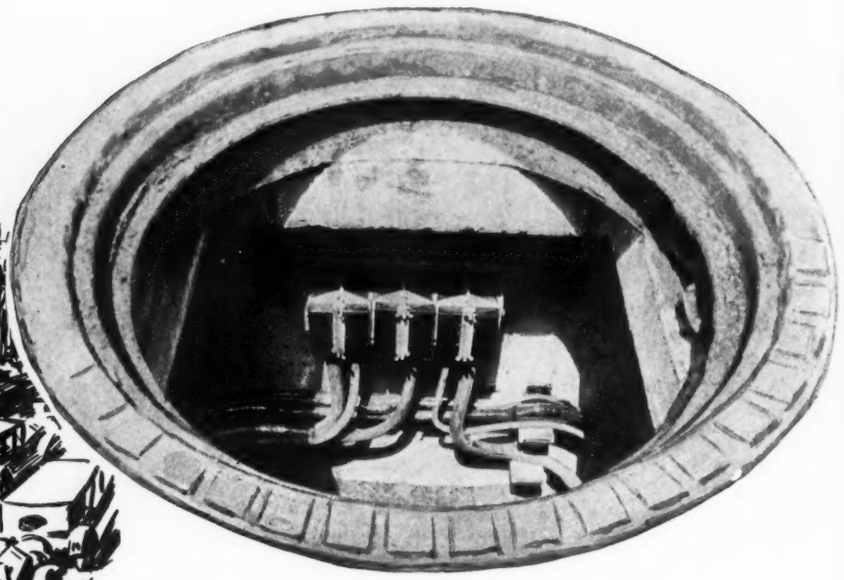

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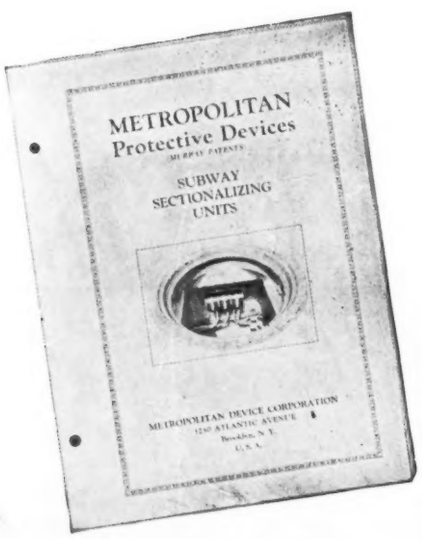

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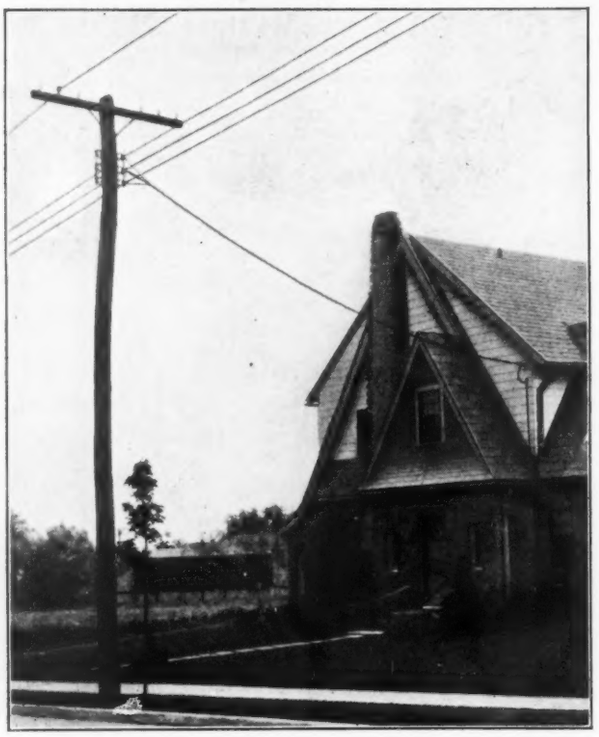

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American Control of Foreign Utilities

THERE is no doubt that American enterprise and capital have been viewed with suspicion in some European countries and that the peaceful penetration in some industries has been resented. However, in public utility work a different attitude is manifested. Many countries are anxious to have experienced American men develop their utilities in American fashion and even offer inducements to have them come. Spain, Italy, Russia, Turkey, Czechoslovakia and the Latin-American republics have seen or heard of what electricity has done for America and seek to emulate us.

Fortunately, the diversity and stability of investment which foreign participation offers is attractive to the holding company and as a consequence more and more money is being poured into foreign utility enterprises. At present the Americas are obtaining the greater part of it, thus cementing still further the bonds of self-interest which unite the United States to them. Nor is our advantage as great as that of these nations. Their natural resources may now be developed. They will experience more prosperity and their citizens gain greater incomes, and, what is of more consequence to them, they will enjoy all the social and industrial advantages which electricity alone makes possible. Elsewhere in this issue will be found an account of the performance of one company which has specialized in foreign utility developments, and among the noteworthy facts brought out none is more significant than the curve of utilization and growth. That of itself shows why American utility experience, participation and control are sought in foreign fields.

* * * *

Carrying Peak Loads

ON MOST utility systems the costs of carrying the peak load are high, and many methods have been suggested to reduce them. The best method is to study load distribution and sell energy under conditions that reduce the peak load, but there is a limit to this method that is soon reached on many properties. Then it becomes necessary to study peak loads from the point of view of maximum system economy in power generation.

At the recent A.S.M.E. convention in New York Prof. A. G. Christie discussed the peak-load problem and indicated many economic and operating advantages in favor of the use of the steam accumulator. These held especially well for systems with modern stations and large peak loads of short duration. Essential system savings are made by having low fixed charges on peak-load facilities and low total costs on base-load plants. A combination of peak-load and base-load stations gives the minimum system power-production costs.

It is unsafe to generalize on the use of the steam accumulator as the cheapest and best peak-load-carrying device. Systems are different and have variations in service standards, in generating-plant reserve and in station first costs and operating costs. But just because the idea of using a steam accumulator is new is no reason for rejecting it for peak-load operation. Even the Diesel engine with its high first cost has been advocated as a peak-load-carrying agency on some systems. The logical procedure is to make a study of each property concerning the utilization of all methods and devices to reduce power costs and then to use the one that offers the most possibilities.

* * * *

Boulder Dam Still Far from Certainty

WITH the modifications made in the Swing-Johnson bill, agreement on the Boulder Dam legislation in Congress appears to be only a matter of days; but whether the President will sign the measure or not, in view of his stand on the power issue, is uncertain. Of one thing, however, there is no doubt. Power production, and not flood control or irrigation, is the main end sought in the project.

It is singular, but none the less characteristic, that Congress should have sidestepped all the implications in the report of the expert engineering commission. These men found fault with the detailed engineering plans on which the proposed legislation is based; they found fault with Boulder Canyon as a site; they showed that income from power would not amortize the cost—in short, they knocked the props from under the whole scheme. Yet the Senate increased the appropriation and passed an amended bill.

Of the sum appropriated, $25,000,000 is set aside for flood control, and yet a dam at Topock, Arizona, would protect Imperial Valley at considerably less cost. Without reference to any income from power, it will be necessary to realize yearly about $1,500,000 from the sale of water for irrigation and domestic water supply to cover the charges applicable to that portion of the project; but southern California, if it keeps up its phenomenal growth, ought to experience no difficulty in meeting that charge.

The greatest part of the appropriation will be allocated to the power phase of the project, and electricity would have to be sold at 1.9 mills per kilowatt-hour at the switchboard to compete with present costs of production from steam at Los Angeles. The Secretary of the Interior is left free to contract with private capital for building the power house, leasing the water or distributing the electricity; but it is doubtful whether any power company would gamble on such a project in view of the increasing efficiency of steam-station performances. If

the project were begun tomorrow, it would require eight years to build it and another seven or eight years to absorb the power. Thus no statement would be forthcoming for fifteen years to show whether the venture were profitable or foolish. However, much remains to be done before the sound of air drills will be heard in Black Canyon, if indeed it is ever heard at all. Who can tell but that the states directly concerned may show more wisdom than Congress by repudiating the whole affair?

* * * *

Code Form and Substance

THE Supreme Court recently required the briefs in a certain case to be entirely rewritten because their form was poor. This action startled the lawyers concerned but was indicative of good sense on the part of the court. In the electrical industry, through a process of historic evolution, codes are apt to become cross-word puzzles to those who attempt to use them and their substance to become befogged by their form.

In the beginning the National Electrical Code was developed to rate fire hazards; then it attempted to fix construction and installation in order to prevent fire hazards, and recently it has incorporated the idea of accident prevention. There is a long history of action and diplomacy back of the present code, and as a consequence the form of the code has become a horrible example of a complex document difficult of interpretation.

The electrical code is operated very largely by electrical contractors. If it is to be used freely, it should have a form that can be understood by even a layman. In all parts of the country insurance inspectors, utility engineers, electrical manufacturers and contractors complain of the form of the present code. It takes a consultation among engineers to decide the exact meaning in many cases, and often two separate groups arrive at different conclusions. The code should be rewritten and clarified. If this is done by the industry, there is every chance that the substance can be understood by all.

* * * *

Unit Costs of Rural Extensions

HOW poor can overhead-line construction be and still be good enough? No one is accused of thinking of rural lines in exactly those terms, but the question would not have to be very differently worded to express with a fair degree of accuracy how more than a few utilities are approaching the farm-extension problem.

To fulfill the important function of providing reliable service, rural lines should measure up to the standard for city service. This does not mean that the same construction specifications need be followed or that as much money must be spent per mile of line. In most cases rural lines can be of fairly light construction, because they will probably carry smaller and light-weight conductors and not many of them. There is not much possibility that more than three or four very heavy wires will be installed. Therefore there is not much reason in providing for pole loadings greatly increased over those considered in the original design. Spans can be made longer than in the city and possibly shorter poles can be used. However, the existence of different conditions gives no license or privilege to skimp on quality of workmanship or materials, or to put up lines that are unsafe, unsightly or in any way to be ashamed of.

There has been much talk of the cost of rural extensions. A thousand dollars a mile is considered to be a pretty good average figure. But it doesn't mean a thing. A poorly built line cannot be assumed to be good merely because it cost a thousand dollars or more a mile, and it does not necessarily follow that a well-built line is a poor one because it costs less than a thousand dollars a mile. The value of a dollar is an intensely localized attribute. Expressed in terms of labor, peanuts or oil paintings, a dollar may have an entirely different value in New Jersey from what it has in Nebraska. A rural extension in one state exactly equivalent in quality of workmanship and material to a line in another state may quite easily cost more or cost less than the other.

The problem confronting the electric utilities is to stimulate utilization of electricity on the farms and carry the energy to them at a cost that will permit an adequate return on the required investment. To obtain a satisfactory solution each central station must attack that problem with its own conditions in mind. No central station will find the solution to its own problem, ready-made and complete, in the practices of others. But it can learn a lot about how to tackle and handle the job by keeping itself informed about what other companies are doing.

* * * *

Modern Railroads

THE last few weeks have seen two Eastern railroads swing over to the policy of further electrification. The Philadelphia & Reading will invest $20,000,000 in expansion for quieter, smokeless, higher-grade service. The Pennsylvania will devote $100,000,000 to the ultimate elimination of steam motive power between New York and Washington. Another great carrier has, if repeated rumors are to be credited, completed its engineering plans for the electrification of a thousand miles of right-of-way. The work undertaken by the Chicago, Milwaukee & St. Paul and the New York, New Haven & Hartford, despite many headshakings and shruggings of shoulders by old-time railroaders, has to a great extent paved the way. The pioneering has been done.

It is hardly necessary to point out the advantages of electrified operation. The shortcomings are few. It is an economic situation rather than any factor in operation which has delayed earlier expansion along major lines. It would appear that in congested areas costs have been reduced to the point which justifies the capital expenditure. The proof lies in the acceptance of the program.

There are many fundamental problems to be solved before long—problems affecting railroads, electric utilities, coal companies and the public. How are these major expenditures to be financed? To what extent will the carriers and the suppliers of energy be justified in pooling capital costs? Upon what basis should rates be established? What should be the nature of the inter-company contract? Will the utility take over coal-purchase contracts or agreements of the railroad? What will be the price policy in regard to purchases of supply fuel?

The subject is no longer academic. Its problems are being solved today, and in their solution it is to be hoped that a broad, far-seeing policy will be adopted, restricted only by a realization of the fundamental values and rights of all the interests involved. Railroad electrification is gaining the recognition that it so richly deserves. American rail-transportation services are entering a new and momentous era.

Steam Heating and Power Sales

IN SUPPLYING power to large buildings and many industrial plants the principal objection to purchased energy arises from the need for steam for structure heating or certain processes. Building owners and industrial operators are not, as a rule, anxious to make the additional investment necessary to install their own power plants, but so long as steam must be had for heating purposes it is also used to generate electrical energy. Many private-plant installations made on this basis have proved uneconomical in practice, and only when the demands for power and steam for heating virtually coincide does the combination power and steam-heating plant prove its worth. Even then, where city steam is available these plants are being shut down and power and heating services are purchased from the utility company.

Central-station companies are finding that the supply of steam-heating service, particularly in the commercial areas, is one of the most effective means of shutting down private plants and forestalling the installation of new ones. In one large Eastern city where the power company operates a steam-heating system no new isolated plant has gone in during the last twenty years and many old ones have been shut down. Another company, operating in a city of a quarter of a million population, is now putting in a steam-heating system which will enable it to take over the power loads in the hotels and several department-store blocks. Steam heating in these cities is made to carry its rightful share of operating expense, and the service is sold at rates to produce a fair return. Where conditions warrant, steam heating has been a valuable asset to the electric utility in its negotiations with some of the customers who are now operating isolated plants chiefly to supply their heating needs. This commercial lighting and power load is also a desirable class of business for the central-station company which by rendering a supplementary heating service can be virtually assured of its permanence.

* * * *

Looking Backward

TODAY it is apparently permitted that one take an occasional glance at the things that have been left behind in the climb up from the past without suffering the penalties imposed upon the ancients. Pillars of salt have given way to a show of reason. Foresight is, however, denied to an amazing degree.

Several weeks ago we commented upon the progress in radio communication and the legal penalties imposed upon some far-sighted promoters and engineers. A recent issue of *Coal Trade* throws an interesting backward glance at a comment of fifty years ago. In a report upon contemporary trade conditions in its issue of October 30, 1878, it was stated:

"Anthracite sales are booming. Bituminous-coal dealers also are reporting satisfactory business. Gas coals are without any special movement as the season is nearly over. Mr. Watkins, president of the Chicago Gas Light & Coke Company, 'does not anticipate any shrinkage in the profits of his company by reason of Edison's alleged discovery of a means to economically utilize electric light.' He says that he has carefully watched the operations of this noted inventor and is unable to see that a method has been established which will furnish light to a large number of consumers at a rate that will enter into any active competition with gas."

One may blush for Mr. Watkins, or his shade, but the same thing is being done today. Who will believe that newspapers will soon be a thing of the past, their place being taken by synchronized television and radio in every home? Who is rash enough to foresee that cities will be no more—since speedy transportation may place us all within minutes of wherever we may desire to go? Who concedes even the remote possibility of a development that will render generating stations and transmission lines useless except as museum pieces? Who dares—yet inevitable change is waiting just around the corner. Today's certainties are tomorrow's amusing, long-dead jests.

* * * *

Leading the Customer by Suggestion

AN INTERESTING aspect of the Hartford Electric Light Company's newly announced residence rate schedules is found in the terminology of their classification. Customers are considered in three groups according as their use of service is "limited," "partial" or "complete," and to each of these classifications an appropriate schedule is applied with the provision that transfer may be made from one schedule to the next upon request of the customer. An evolution is thus marked in the growth of the customer's use of electricity from the low volume of monthly consumption suitable to the limited schedule to the large volume embraced in the so-called complete-use tariff. These rates are naturally of the promotional type, yielding minimum prices per kilowatt-hour for the larger consumptions, and in this no novelty exists; but in the classifications utilized in the company's advertising and other setting forth of the rates a distinct psychological appeal has been added to the lure of a lower unit price for increased use.

Limitations of any sort seldom attract the enthusiasm of Americans, and the Hartford company's policy is designed by both implication and incentive to guide the domestic small user away from the corresponding classification. The commonly employed sharp dividing line between rate schedule brackets is absent here, and it is believed that customers will pass easily from one group to the other as their consumption increases.

Obviously, complete use of service for the major domestic applications of refrigeration, cooking, water heating, ironing and liberal-scale lighting is a desideratum which a greatly increased number of customers will appreciate as the economy of the corresponding rates becomes understood. In other words, the company in announcing these rates has placed before its community a picture of the fully electrified home as an attainable objective, and already 2,600 of its 55,000 residential customers are listed in the "complete-use" classification. The others will be billed on the "partial-use" schedule unless they ask to go back to the "limited-use" tariff or forward to "complete use."

One cannot escape the conclusion that the company is likely to enjoy a further substantial increase in its sales of energy per residence customer as a direct result of the use of suggestion in these tariffs, which combine low energy rates with area flat charges as based upon several years' experience with the "pulling power" of promotional schedules. And, coincidentally, the average price per kilowatt-hour consumed will decrease as the annual revenue per customer rises.

A Merry Christmas
and
A Happy New Year

WE APPRECIATE THE CO-OPERATION, COUNSEL AND SUPPORT that we have received this year from so many of our friends in the electrical industry. They have given generous help in recounting their experiences, practices, policies and progress. They have made it possible for us to render a more helpful service.

Textile Mill Electrification

*in the Southeast**

Of 17,000,000 spindles, 75 per cent are driven electrically, 80 per cent of which operate on purchased power. Discussion of types of drive and requirements of textile machinery

By Edwin W. Clapp† and A. G. Sanford‡

THE phenomenal growth of the textile industry in the Southeast during the last fifteen years is known to nearly everybody. A contributable factor to this development has been the co-ordination of the activities of the manufacturer of electrical apparatus, the machinery manufacturer, the central station and the consulting engineer in working out problems of application, illumination and continuity of service.

The fact that there are only a few mills in the Southeast that are not using some form of electric drive is *prima facie* evidence of the desirability and advantages of this form of drive.

There are approximately 17,000,000 spindles in the Southeast today and about 75 per cent of these spindles are driven electrically. Approximately 80 per cent of the electrically driven mills are using central-station power. It is in most cases cheaper, power averaging from 1.75 per cent to 0.75 per cent per kilowatt-hour, depending on the size of the load. It does not necessitate using capital funds for non-producing and non-dividend-earning machinery. It is much more flexible and does not put the mill at the mercy of the labor problems and physical hazards of the mining and transportation industries.

Today there exists a network of transmission extending over the entire Southeast, all tied in together. Practically all trunk lines consist of dual conductors and nearly all primary feeders and distribution have tie lines, thereby insuring continuous service.

Interchange of power helps to work out a balance between hydro plants located on different watersheds, compensating for diversity in rainfall over different sections, and tends to equalize the delivery of prime power over a period of time between a high-head storage station and a low-head, stream-flow station.

A large block of high-economy steam reserve is ready for service on call. These steam stations are located at strategic points on the system.

In contrast to the oversold condition existing a few years ago the utilities have anticipated the increase in load for several years to come, have worked out a program to meet these requirements and today there is a comfortable surplus of power. As this power is absorbed new developments are made. From now on the supply will be ahead of the demand.

The textile load has always enjoyed a high load factor, but the introduction of the individual drive with a large number of small motors usually operated considerably under-loaded has created lower power-factor conditions. Some of the central stations in this district are working on a bonus proposition for power-factor correction that will make it worth while for the mill to install the necessary corrective equipment. The day of purchased power on a kilovolt-ampere basis is not far away.

In bleacheries, dye houses, finishing plants and rayon plants, which require a large amount of process steam, an ideal form of electrification is the installation of a non-condensing steam turbine, the exhaust being used for manufacturing purposes and the balance of the electric load being furnished by the central station.

The central station realizes that it cannot grow and develop unless the communities and industries it serves are growing and expanding. Recognizing the fact that the Southeast is a logical place for the development of the textile industry, it has a corps of men working continuously in other textile centers to bring new textile industries into this section. The combined efforts of

Table I—Actual Cost per Spindle to Electrify Textile Plants Manufacturing Cotton Goods

Y	Yarn mill	SW	Spinning and weaving mill
G	Group drive*	I	Individual drive throughout
IL	Individual loom drives	IS	Individual spinning drives
IT	Individual twister drives	Dr.	Drill
TC	Tire cord	Sh.	Sheeting

No. of Ring Spindles	Year Installed	Goods Mfg.	Type Drive	Total Motor Hp.	Cost per Spindle
12,000–Y	1923	40's–2 ply	I	1040	$4.13
8,000–Y	1926	28's–2 ply	I	650	3.00
19,000–Y	1927	60's–2 ply	I	1284	2.60
11,400–Y	1924	Hosiery yarn	IS–G	675	1.80
18,400–Y	1926	18's ply	G	1225	1.65
19,700–Y	1926	20's combed	G	1165	1.40
13,400–SW	1925	Wide sh.	G	1028	1.80
16,100–SW	1927	Narrow sh.	G	977	1.80
8,700–SW	1927	Dr–sh.	G	480	1.75
10,500–SW	1927	Dr–sh.	G	639	1.65
50,000–SW	1927	Narrow sh.	G	3139	1.63
30,000–SW	1927	Narrow sh.	G	1440	1.30
6,500–SW	1927	Dr–sh.	G	568	2.15
16,700–SW	1926	Towels and Merino yarn	G	1155	2.10
5,000–SW	1923	Narrow sh.	IL–G	335	3.65
13,600–SW	1923	Outing	IL–G	1027	3.56
14,400–SW	1923	Chambry	IL–G	900	3.05
8,400–SW	1926	Napped sh.	I	633	4.50
17,700–SW	1923	No. duck sh.	G	1437	2.05
12,900–SW	1926	No. duck	IT–G	1673	3.60
10,500–SW	1927	Duck	IS–IT IL–G	1062	3.90
14,200–SW	1925	Tire cord and Fabric	IT–IL G	1430	2.80
32,300–SW	1927	Tire cord and Fabric	IS–IT IL–G	2970	3.60
30,200–S	1927	Tire cord	IT–G	2864	4.37

*Items indicated as group drive include, in all cases, individual drive on the picker room machinery.

**Abstract of a paper presented at the recent regional meeting of Southern District No. 4 of the A.I.E.E., Atlanta, Ga.*

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this activity have resulted in several hundred thousand spindles being located in the Southeast. This, of course, has resulted in direct benefit to the utility, but the indirect benefits gained by the communities in which these new industries have been located are far greater.

The field of development for the use of electric power in the textile industry is unlimited. The tremendous research facilities of the electrical manufacturer and the machinery manufacturer, together with the consulting engineer in the field and the central station, are working harmoniously together to keep continuously improving their responsibility to the industry.

Application of the Electric Drive in the Textile Mill

With the design of textile motors and controls highly perfected the manufacture of this equipment is largely a commercial problem. Much consideration is now being given to the various mechanical features in the equipment itself and in the physical application of this equipment to the textile machines. Great improvement has been made in the design of the motor bearings and many types of silent chains and other transmission equipment suitable for short center drives are available.

Table II—Power Requirements of Textile Machinery

Textile Machine	Actual Horsepower	Size Motor for Individual Drive
Bale breaker	¾–1½	1–2
Vertical opener	5½	7½
Conveyor fan and condenser	4–12	5–15
Breaker—lapper—single beater	6	7½
Intermediate lapper	4	5
Finisher lapper	4	5
Card—40 in. revolving flat cotton	1	1½
Card—wool—full roller breaker	2	3
Card—wool—full roller finisher	3½	5
Silver lap	¾	1
Ribber lap	1	2
Comber, with aspirator	1½	2
Drawing frame	5 to 6 deliveries per hp.	
Slubber	45 to 55 spin. per hp.	
Intermediate	55 to 60 spin. per hp.	
Fine frame	60 to 80 spin. per hp.	
Jack frame	85 to 95 spin. per hp.	
Spinning frame—ring	30 to 100 spin. per hp.	
Spinning frame—mule	100 to 150 spin. per hp.	
Spooler, 100 sp	½	¾
Warper	½	¾
Twister	15 to 40 spin. per hp.	
Twisters—cabling	8–14	10–15
Slasher	3½	5
Loom—light 40 in. automatic	½	¾
Loom—heavy	½	¾ and up
Loom—narrow on light silk	¼	½–¾
Winder—quiller	½–¾	¾
Winder—cap and butt—15 sp	3½	5
Winder—cone and tube 100 sp	4	5
Brusher	3–8	5–10
Napper	4–8	5–10
Inspecting table	½–¾	¾–1
Quiller—silk, 40 sp	¼	½
Winder—silk, 100 sp	¼	½
Warp, Mill—silk	½–⅝	¾

The successful development of compact and inexpensive magnetic starters with push-button control stations has contributed toward the increased consideration given the individual drives.

That an increase in production per spindle-hour of mill operation can be realized in the majority of cases with the electric drive, as compared with the steam engine and mechanical drive, is well recognized by those who have carefully noted the results obtained in plants that have discarded the steam power equipment. In a 30,000-spindle spinning and weaving mill on narrow sheeting, which has been electrified within the past year, an actual increase in production of 7 per cent has been realized, of which percentage the owners have attributed 5 per cent to the electric drive and 2 per cent to the fact that the entire mill had been operated slightly under speed on account of the overloaded condition of the steam engine. Another similar mill of 13,400 spindles on wide sheeting has an annual increase in production of slightly more than 4 per cent. Still another mill which has come under the author's observation is of 11,400 spindles on hosiery yarns, from which the records show an increase of approximately 3½ per cent since electrifying.

The foregoing examples indicate clearly the possibilities and these cases are of particular interest since no additional machinery was added and no changes whatever in the goods manufactured were made.

Satisfactory records are available from a large number of installations showing a range of from 1 per cent to as high as 10 per cent increase in production. An average increase of 3 per cent may conservatively be expected between corresponding mills on steam and small group electric drive and 4 to 5 per cent for mills on complete individual drive.

The reasons for the increase in production per spindle-hour of mill operation may be summed up as follows:

1. The greater speed at which the mill can be started up and stopped.

2. The greater flexibility in the operation of the several departments, enabling each to be run at its maximum production and to maintain a balanced output from the entire machinery organization.

3. A more constantly maintained speed at the value desired, affecting not only the over-all production but also the quality of the product.

In the textile industry the speed at which the individual workers perform their duties does not have as great an effect on the output as is the case in numerous industrial activities where many parts must be handled before the manufactured article is complete. In the manufacture of textiles the production is largely controlled by the three factors mentioned above.

Group Drive Versus Individual Drive

From the standpoint of first cost only, either for a new mill or one to be changed to the electric drive, the group drive is considerably cheaper; however, this differential is considerably reduced in the case of a new mill where the cost of the shafting, belting, pulleys, etc., would have to be taken into consideration. No further explanation of the reason for the increased cost of the individual drive is necessary, since it is evident that the cost per horsepower for motors, starters and wiring increases as the rating of the motors decreases.

It has long been conceded that the individual drive is superior and justifies itself from a first cost standpoint for certain operations. For example, the picker room machinery, while performing only a preparatory operation, is readily adapted to the individual motor, while the elimination of the countershaft and several large pulleys on the machine itself somewhat reduces the extra first cost of the individual drive.

In the authors' opinion, the individual loom motor is unquestionably a logical and superior application and practically no new weave mills have been equipped in the past few years, and probably will not be in the future, with other than the individual motor drive on these machines. The few to be equipped with group drive have been controlled more from the standpoint of first cost than from lack of appreciation of the value of this application. The higher maintained speed and the similarity of operation of all of the looms, together with the freedom from variation due to unequal belt tensions, all contribute to a considerable increase in production and uniformity of finished product.

On account of the starting requirements the total connected motor horsepower will be greater in the case of the individual drives, resulting in a lower plant load factor. However, any increase in the electrical losses occasioned by operating under these conditions is more than offset by the reduction in shafting and mechanical transmission losses. The newly developed double cage windings for squirrel-cage induction motors produce the high starting torque necessary for many textile machines without affecting the efficiency and power-factor characteristics after the motor has attained normal speed. This type of motor will permit of a reduction in the total motor horsepower and reduce proportionately the cost of the individual drive.

In general, the over-all power factor of the plant load is usually higher with the group drive than with the individual drive. In mills consisting mainly of small group drives power factors between 81 per cent and 86 per cent can usually be easily obtained, while for mills with individual drives the over-all plant power factor will usually vary between 75 per cent and 80 per cent, although the author has noted power factors as high as 85 per cent on this type of installation.

Cost of Electrical Installation

In Table I is given the actual cost per spindle to electrify textile plants, manufacturing cotton goods, together with the total connected motor horsepower installed at the time each installation was made. This information has been compiled from actual records. The cost per spindle includes the cost of the electrical apparatus, power wiring and lighting transformers installed complete, but does not include the cost of any substation or generative equipment, mill lighting system or low-tension feeders between the substation and the switchboard.

Variation in the cost per spindle of different plants on the same product and employing the same type of drives is occasioned by numerous factors, such as the arrangement of the buildings and whether of one or more stories, all of which affect the cost of the wiring, while the number of spindles on the various machines being different in different plants affects to some extent the total connected horsepower. Several of the items given in the table cover additions to existing plants, which cases usually are lower in installation cost than the original unit.

Horsepower Requirements

In Table II is given the average horsepower requirement of various textile machinery and the horsepower rating of motors used for individual drive. Where a range of horsepower requirement or motor rating is given for any item the indication is that the machine may be constructed of more than one size or number of spindles and the nearest standard motor rating should be applied for any specific installation.

What has been mentioned with reference to the value of the electric drive in textile plants manufacturing plain cotton goods applies in an even greater extent to plants on woolen, silk and rayon products, since increased production and uniformity of finished product are translated into increasingly greater profit as the value of the finished product increases. In the manufacture of knitted goods motor drives have been successfully applied to all machines.

For bleaching, dyeing and finishing plants the electric drive has proved its worth and individual drives have satisfactorily been applied on practically all finishing plant machinery. Due to a lower operating load factor occasioned by the fact that many finishing machines do not operate as continuously as in the spinning and weaving mills, and because of the variable speed requirements, the individual drive is especially desirable.

Future Developments

But little further improvement can be desired or expected in the motor and control equipment as now applied to textile machinery. There is, however, much that can be done, through co-operation between the textile machinery and electrical equipment manufacturers, with the view of making the motor equipment a more integral part of the complete machine. It is probable that many features in the design of the textile machinery, which are necessary from the standpoint of a belt drive, could be changed to adapt more readily the individual motor equipment and at the same time reduce the cost of the complete machine and drive.

Other future developments will no doubt embrace many improvements along the line of automatic control and regulation of the electrical equipment which will govern, to a large extent, the operation of the machines and the quality of the goods produced.

Heat, electrically produced, for slashers and for mercerizing and finishing plants, as well as for the mill buildings, are now feasible and future developments will no doubt make these applications commercially practical realities.

Further improvements in power-factor corrective apparatus and motors having an inherently high power factor can be looked for in keeping with the increased interest manifested in load power factor.

Aside from its importance as the motive power, such miscellaneous applications as the electric stop motions and signaling devices on individual machines, Klaxon and siren type horns for signaling the operators, electric calling and intercommunicating systems, motor-driven drinking water systems, motor-driven air compressor plants for cleaning, these being automatically controlled to maintain the required air pressure, and individual motor-driven humidifier heads and air-conditioning equipment may be mentioned, while good lighting is recognized as an income producing investment.

Cost of Substation Equipment, 1926-27

From a New England Utility—Labor, Installation and Freight Omitted.

Material	Cost per Unit	Total
Two type H-5 5-amp. ammeters	$30.00	$60.00
Two type H-2 5-amp. ammeters	65.00	130.00
Two type H-5 175-volt voltmeters	40.00	80.00
Two three-way ammeter transfer switches	12.50	25.00
Two eight-point potential receptacles	4.00	8.00
Two six-point synchronizing receptacles	3.00	6.00
Two single-pole, double-throw control switches designed for 125-volt service	10.00	20.00
Six inverse type overload induction relays	23.50	141.60
One switchboard panel	.....	60.00
Two solenoid-operated oil circuit-breakers, 400 amp., 37,000 volts	3,900.00	7,800.00
Two tank lifters	150.00	300.00
Six type KO outdoor current transformers, oil-filled, 150-300 amp. with bypass	217.00	1,302.00
Four outdoor type 22,000 to 110-volt potential transformers	275.00	1,100.00
Eight combined expulsion fuses and disconnect switches	45.00	360.00
Two three-phase oxide film lightning arresters	733.00	1,466.00
Fifteen 300-amp., type LG207 disconnects	37.00	555.00
Fifteen 300-amp., type LG120 disconnects	55.00	825.00

Manufacturers' Drawings Inadequate for Customers' Use

By omission of data necessary to the design of installations time and money are wasted by maker and user. Suggestions for overcoming problem

By M. M. Samuels
J. G. White Engineering Corporation, New York

IN THIS age of efficiency, economy and standardization it is surprising that only on rare occasions does a manufacturer's drawing showing a piece of apparatus give all the information which is required for making this apparatus a part of a station. Sometimes the weight which is needed for determining the crane size is lacking, or the clear space required for handling removable parts is not indicated. Another time the details of the base design necessary for foundation design are omitted, or the details of a pipe connection which may be necessary for connecting apparatus to a piping system are missing. Generally the missing information consists of dimensions or other items which are not needed at the factory for producing the apparatus, but which are very important for station design. Even those companies which do not send the customer the detail shop drawings, but send him special outline drawings made specifically for the customer's use, only seldom give all the information that the customer needs.

Viewpoint of Customer Overlooked

The reason probably lies in the fact that the apparatus designer is absorbed in apparatus design and cannot very well be familiar with the customer's requirements.

The lack of such information often leads to endless corrrespondence, revision of drawings and sending blueprints back and forth a number of times—an enormous waste of time and money both to the manufacturer and the customer and a great deal of aggravation on both sides. The men who make the drawings generally have such information available on their desks or drawing boards or in a closet close at hand, and it would require only a few minutes to add it on the drawing, if the manufacturers had standing instructions that such information must be added on the drawings. The money wasted by the lack of such information must run into a good many thousands of dollars annually for each of the larger manufacturers, and the loss in good will by annoyances and delays is inestimable.

Essential Information Analyzed

An investigation over many years of needless correspondence, filing and refiling, checking and rechecking of blueprints, hurry trips to the factories and nerve-wrecking aggravation brings out the fact that the lacking details are generally of the same character, whether they refer to large turbo-generators, transformers, switchboards or fuse holders. The accompanying suggestions attempt to systematize and summarize the various points which, when given proper attention at the factories, will no doubt result in great savings in time and money to both of the interested parties.

One or two points may have been left out in the accompanying suggestions, but in general they cover the ground for all electrical apparatus and probably also for mechanical equipment. To those with little experience in station design they may appear picayune and small-time requirements. But any one who has had to design stations will recollect cases in which many of these small items caused great delays in getting out foundation and steel designs with consequent delays in construction. The remedy is so easy and obvious that it should not require any further suggestions to make the manufacturers give it serious consideration. In the end it will be to their own advantage.

Frequently Omitted Information on Manufacturers' Drawings

1. *Over-all Dimension*—The outline drawing should dimension all projections. It frequently happens that an outline drawing is used as a basis for station design, and after the installation of same it is found that small parts project out beyond the outline shown on this drawing, causing interferences with other apparatus or with walkways.

2. *Foundations.*—The design of the bottom of the base should be shown in detail, giving all information required for designing foundations, location of bolts as well as thickness of metal to be bolted, clearance dimensions for anything projecting through the base, etc.

3. *Terminals.*—Location and sizes of all terminals should be given on the drawings with all necessary clearance dimensions. The parts to which the terminals are bolted should also be given so that when the customer desires to remove a terminal and use a bar connection or another type of terminal he should have all the necessary dimensions without referring the matter to the factory. The connections for star, delta, etc., as well as the direction of rotation should also be shown.

4. *Pipe Connections and Gages.*—All fittings on apparatus, to which the customer has to connect any pipe or conduit, should be shown in detail, giving not only the size of pipe, but the location of the end of the fitting in relation to machine center lines. All gage locations should be dimensioned.

5. *Water, Air, Oil or Power Supply.*—Whenever a supply of water, oil, air or power is required all necessary data should be given on the drawing, such as gallons or cubic feet per minute, pressure, etc., volts, starting and running amperes, phases, frequency, etc.

6. *Air Ducts.*—At the air inlet and outlet the flanges to which the air ducts are to be attached should be shown in detail.

7. *Weights.*—The total net weight, as well as the weight of heaviest piece and other component parts, should be given on the drawing.

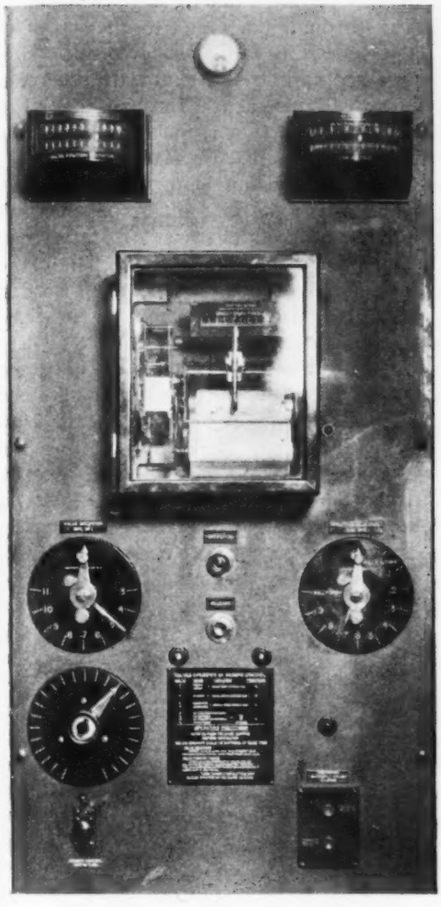
8. *Dismantling.*—Locations of all joints for dismantling, as well as the details of all eyes or hooks for handling, should be shown in detail. If a sling is to be used, such sling should be indicated, giving location of crane hook in relation to same.

9. *Handling Space.*—Extra length, height or width of space beyond apparatus which may be required for dismantling or handling the whole apparatus or parts of same should be shown in relation to apparatus center lines.

10. *Crane Height.*—Minimum dimensions from bottom of base to bottom of crane hook should be indicated on the drawing.

11. *Shaft.*—Details of shaft end and coupling and location of same in relation to machine center line should also be shown in detail.

12. *Parts Not Furnished.*—If a drawing shows any parts which are not being furnished by the manufacturer the drawing should state explicitly at each such part that it is not being furnished.



Operator in Bucks Creek power house can ascertain water level in forebay and position of eleven valves as well as control them

Remote Control Conserves Water

Complete remote valve control and water-level indicating system is applied to Bucks Creek plant. Use of standard apparatus and only four control wires are important features

By R. L. WEBB

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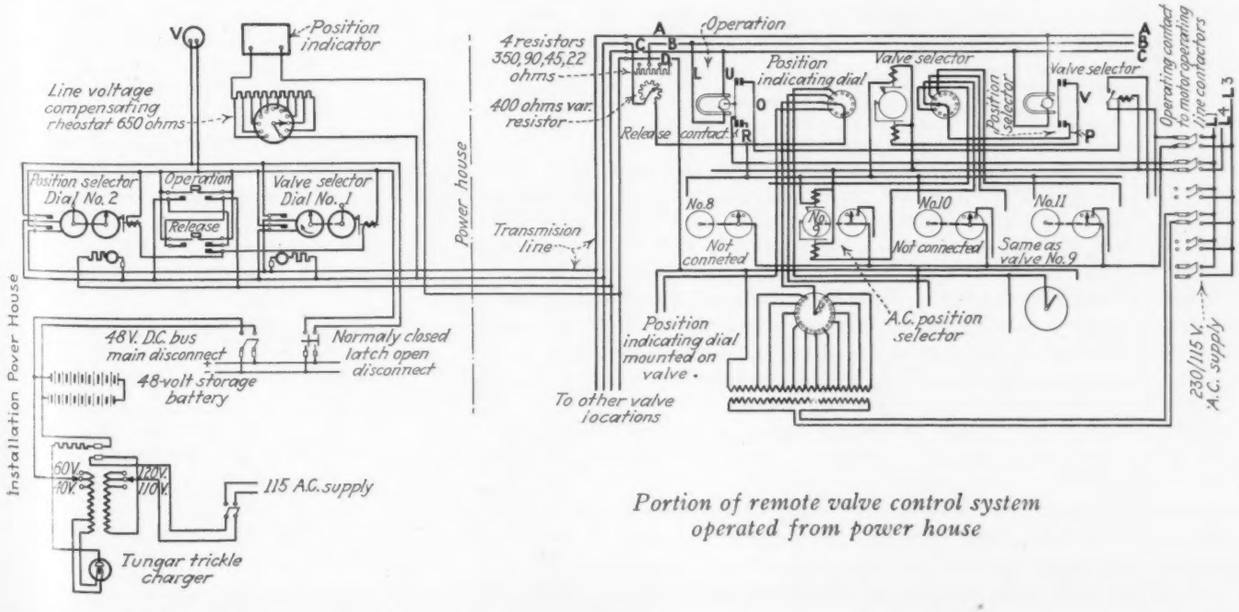
ONE of the important problems in the design of the Bucks Creek hydro-electric project of the Feather River Power Company was the remote control of valves and gates and indication of the forebay water level. The water system of the project, as shown by the accompanying map, consists of a main storage reservoir and a diversion reservoir, from which the stored water is diverted from Bucks Creek through a tunnel into Grizzly Creek, flowing into a forebay on this creek which drains a different watershed.

As the capacity of the forebay is small it is desired to use the run-off of the Grizzly Creek watershed to the greatest extent, thus conserving the stored water in the storage reservoir. Consequently it is necessary that the water level in the forebay be known in the power house at all times and that the operator in the power house be able to control the flow from the storage and diversion reservoirs so the lack of water in Grizzly Creek can be made up from storage.

Systems and devices providing parts of such control and indication have been used in the past, but owing to their complicated and delicate nature and the number and cost of control wires required they have seldom been used. On the Bucks Creek project it was necessary, first, that the water level in the forebay be recorded in the power house; this is done by transmitters of the "Selsyn" or controller type, one connected to a float in the forebay, the other in the power house operating the pen of a recording meter; second, that the position of the valves and gates along the waterways be ascertainable at the power house; third, that these valves and

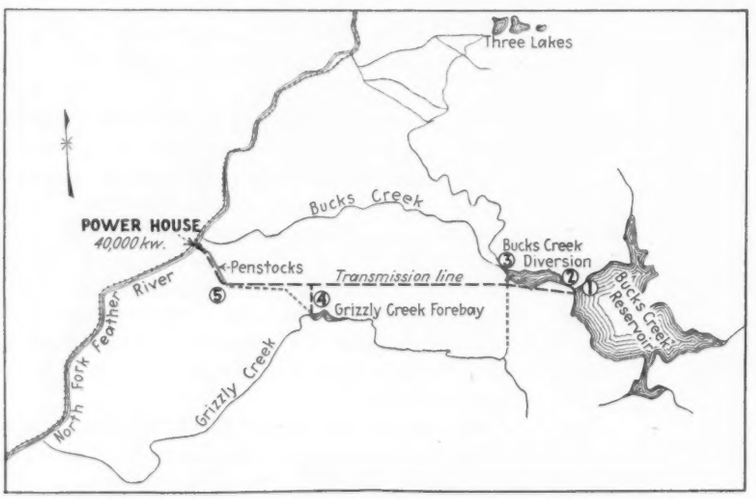


Portion of remote valve control system operated from power house

gates, which are all electric-motor driven, can be operated from the power house. This was accomplished by a remote-control system requiring only three wires for indicating forebay water level and four wires for the remote contro! of eleven valves along conduits and tunnels.

Water Level Recorder

The forebay water level indicator consists of a float having a travel of about 50 ft. driving a "controller" transmitter motor. Mounted on the back of the control board at the power house is a receiver of similar type geared to the transmitting mechanism of a Westinghouse graphic instrument with roll chart. The gearing of the transmitter and receiver is such that the pen makes one complete traverse of the chart in the 50 ft. of float travel.



Bucks Creek hydro-electric project showing position of valves operated by remote control

(1) Outlet tower, Bucks Creek storage reservoir, contains two sluice gates (Nos. 1 and 2) not operated by the remote control. One telephone in valve house, one telephone in caretaker's cottage. (2) Needle valve house, Bucks Creek storage dam, contains two needle valves (Nos. 3 and 4), each to have ten positions from closed to open, to be operated either from the power house or valve house telephone. (3) Outlet tower, Bucks Creek diversion reservoir, contains one cylinder valve which shall have ten positions from closed to open. To be operated either from the power house or valve house telephone. (4) Outlet tower, Grizzly Creek forebay, contains two sluice gates. These shall be either open or closed and can be operated either from the power house or valve house. In this house will be the float mechanism to record the water level of the forebay in the power house telephone. (5) Top of penstock, contains two butterfly valves, each with by-pass. All to be either open or closed and be operated either from power house or valve house. Each penstock will have a pressure device that will prevent the butterfly valve being opened until its penstock is full of water. One telephone. (PH) Valve selectors by which valves Nos. 3 to 11 can be operated or position indicated. The forebay water level recorder and telephone exchange will be located here.

To prevent the possibility of transmitter and receiver getting out of phase should the power supply be interrupted for an interval of time during which the forebay water level should change, a closed circuit type of solenoid latch is provided to lock the mechanism upon failure of exciting current. Thus both transmitter and receiver remain stationary during an interruption of service. Should an interruption be of sufficient duration to permit the forebay water level to change appreciably, damage to the mechanism from overspeed while assuming the new position is prevented by a centrifugally operated brake which is combined with the float mechanism.

The recording instrument on the power house control panel is a Westinghouse type R, the electric clock for driving the paper roll and the recording arm and worm only being used. On the rear of the panel behind the recording instrument is mounted one of the "controllers," the shaft extending through the panel to the worm of the recording meter. From the stator of this "controller" three wires are run to the stator of the other "controller" in the valve house at the forebay, this latter having its rotor excited by current from the same source as the one in the power house. A standard scale of zero to fifty is used, one division being 1 ft. of water in the forebay. The time scale is 2 in. of paper travel per hour. In the wall of the outlet tower of the forebay a float well is provided. The float is connected to the "controller" by a phosphor bronze tap and gears so that the 1-ft. rise or fall to equal one division on the scale of the instrument in the power house is obtained.

The valve control utilizes a direct-current selector system to control the alternating-current motor-operated valves. A small multi-tap transformer connected with a graduated voltmeter on the power house control board gives a position indication for each valve. The voltmeter is graduated in tenths of total valve opening. On the control panel are two selector dials; the first selects a particular valve and the second determines the opening to which the valve will move when an actuating knob is turned. The second dial is graduated in tenths and the valve selected by the first dial will take up the position indicated by the second.

Owing to the great distances between the several valves and the power house it was desirable to keep the amount of direct current required as low as possible. The use of alternating-current ratchet relays obviated the necessity of transmitting heavy direct current over the control wires and also the need of placing storage batteries at each of the valve houses. The small amount of direct current required for the system is applied from a 24-cell, 48-volt, 24 amp.-hour Exide storage battery located in the battery room of the power house. Power to operate the valve motors is supplied by an 11,000-volt, three-phase line running from the power house to the valve houses. On the same poles are placed the wires for the remote valve control and water level recording. Four wires are required for the valve control which are designated as "a," "b," "c" and "d." These four wires run to all four valve houses and in addition to their remote control function they could be utilized for telephone communication if desired without in any way affecting the valve control. The four wires for valve control as well as the three for the water level indicator are all No. 6 EBB iron.

At each valve house is a locked metal cabinet which contains:

Two Butte* polarized relays to receive the direct-current impulses from the power house.

A valve selector Butte ratchet relay with two index plates, one being required for each valve house.

A valve position Butte ratchet relay for each valve with single index plate.

An adjustable resistance to compensate for line drop between the various valve houses.

A single-pole, 220-volt magnetic contactor, the coils of which are for 110 volts.

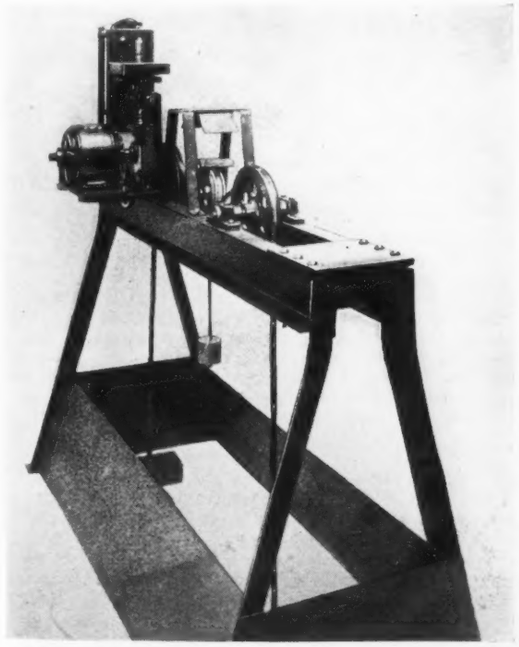
A double-throw triple-pole switch for each valve.

A three-button, push-button switch for each valve.

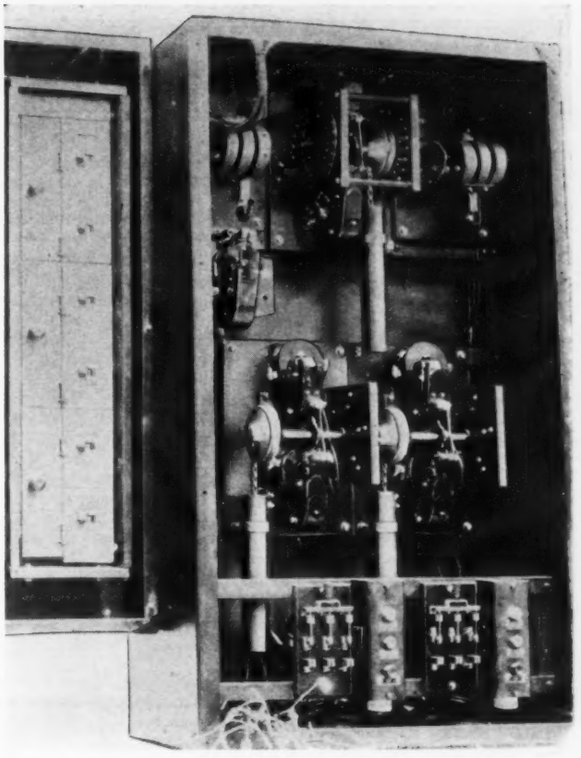
Butte Electric & Manufacturing Company.

All of this apparatus is mounted in the cabinet illustrated. Two sets of doors are provided, one before the relays, the other before the double-throw switches and push-button stations. The key for the former will open the latter, but the key for the latter will not open the former. The reason for the double set of doors with different locks is to permit a man sent to operate the valve in case of emergency or at times of making repairs to open the lower door of the cabinet and gain access to the double-throw switches and push buttons without opening the upper door, which gives access to the relays. Blocks are placed on the lower doors of the cabinets, which give access to the double-throw switches, so that these doors cannot be closed and locked unless the double-throw switch is in position for control of the valve from the power house. With each of the 220-volt, three-phase valve motors there was provided a Westinghouse 11-165 magnetic reversing contactor with a three-button station. These buttons are marked "Open," "Close" and "Stop." It was desired that all valve motors could be operated in the valve house, hence this double-throw switch for transferring control to either the local push-button station or the remote control in the power house.

All of the valves have General Electric type H limit switches geared to their operating mechanism for stopping the motor when predetermined points of travel are reached. On the shaft of the limit switches are mounted the position indicator switches. While using the remote control the motor can be stopped at any point of travel, but on three valves, Nos. 3, 4 and 5, ten points of opening were desired so that for these three valves a ten-position drum limit switch and direction selector was designed. This is geared to the valve mechanism and is on the same shaft with the position indicating switch. This drum switch will stop the motor at the selected point of valve opening. All of the valves can be manually operated by means of a handle, there being a clutch to cut the motor out. Provision is made to lock the valve and the motor so that when the safety switch is locked open the valve can by no means, electrical or manual, be operated.



Float-operated mechanism records forebay water level in power house, 3½ miles distant



Some relays in a valve house by which remote position indication and operation are secured

Also a 220-volt transformer with multi-tapped secondary is connected to the drum switch so that when the circuit is closed the voltage shows the position of the valve in the power house on a position indicator of the voltmeter type which is calibrated in tenths of full valve opening.

Valve Operation

The two selectors on the power house panel are special adaptations of fire-alarm code-sending devices. The handles are turned to the desired number on the index plate and released. They return to the stop, making and breaking a contact a number of times equal to the number dialed. Attached to the handle is a pointer that remains on the number selected, or dialed, as a check on what number has been selected. This pointer is released when clearing the system. The two selectors are connected between wires "a" and "b" running to the valve houses so that the valve selector sends impulses in the opposite direction to that of the position selector in the power house.

There are four distinct operations performed over the four wires to change the position of any valve.

1. Valve selection which shows the present position of the valve selected.
2. Valve position selection.
3. Operating the desired valve by turning the "Operation" button. (The position indicator will show, step by step, the progress of the valve to the new position.) Control is under the operator at all times and the operation can be stopped at any point by him if necessary, although the drum and limit switches will stop the motor automatically when the position selected is attained.

Typical Valve-Operating Procedure

First—Push the release button, which insures that the system is clear to start with.

Second—Turn valve selector handle to the number of desired valve (in this case No. 4) on the index plate and release same. The handle will return to the stop, sending four d.c. impulses over wires "a" and "b" to each of the valve houses. The four polarized relays in parallel between these two wires, one in each valve house, will close the 110-volt a.c. circuit four times, sending impulses to the valve selector ratchet relays, driving their two index arms over dead contacts to point No. 4. A valve selector ratchet relay in each valve house which has two index plates and arms is now on position 4. Through one of these index plates on which an arm of the relay rests the multi-tap transformer is connected through to the position indicator in the power house, thus showing the present position of this valve. The other segment under an arm is connected to the position relay of valve No. 4. The valve selected is a multi-position valve having ten points of opening. It is assumed to be closed, in which case the lowest tap on the multi-tap transformer is connected through to the position indicator in the power house.

It is desired to open valve No. 4 seven-tenths. Turn position selector to point No. 7 on the index plate and release. The handle will return sending seven impulses through valve selector relay in valve house No. 2 to the position relay of valve No. 4, driving it seven steps. The valve remains as before, as nothing has occurred to affect the coils of the magnetic reversing master switch. The pointer on the valve selector now points to valve No. 4 and the position indicator shows this valve to be closed. The pointer of the position selector is on No. 7, the desired new position. Thus there is a check on the number of the valve selected and its present and desired position before starting the motor.

The "Operation" button is now pushed and closes the circuit through wires "b" and "c," throwing the four polarized relays, one in each valve house, but only the one in valve house No. 2 is connected through to the 110-volt a.c. contactor coil, which now closes admitting 220 volts a.c. through one of the two operating coils of the 11-165 Westinghouse magnetic self-starter. The motor starts in the direction to open the selected valve, the position switch showing step by step until position seven is attained, when the circuit of the reversing starter is opened, the contactor arms of which fall out and the motor stops. The position indicated in the power house is on point seven. The operation is completed. Push the "Release" button, on which the system is cleared and ready for another operation.

4. Clearing the system.

In the accompanying panel is a detailed description of each event in changing the position of a valve, taking valve No. 4 in valve house No. 2 as an example.

ACKNOWLEDGMENT

While the writer conceived the idea and superintended the construction of the previously described system and apparatus, he wishes to acknowledge that the design of the various parts and the adaptation of standard parts is that of the Butte Electric & Manufacturing Company of San Francisco. He also wishes to acknowledge the help and suggestions of Messrs. George Eveland, P. T. Regan, M. E. Hughes and C. E. Bentley of the staff of the Constant Angle Arch Dam Company, also of San Francisco, who were the consulting engineers on the entire project.

Distribution Transformer Design

THE relatively greater degree to which transformers, particularly smaller sizes, figure in rural as compared with urban distribution inspired in 1923 the starting of an investigation at Iowa State College on the design of small transformers. This investigation is now completed and its results are reported in Bulletin No. 87 of the college by J. K. McNeely and E. R. McKee.

The object of the investigation, specifically, was to compare various makes of transformers on a basis of over-all economy consistent with a sufficiently high standard of operation and from this comparison to establish a best design for rural distribution requirements. The bulletin contains the development of a direct method for determination of design when the costs of energy loss, material and labor and overload and operating cycle are known. Calculations, tables and curves present the analyses of performances of the various makes of small transformers and the effects of different factors on design.

As illustrative of the variations of design between makes the bulletin comments on the sizes of the transformers rated at 1.5 kva. which were used in the tests:

Some manufacturers state that the size of their transformer is determined by what they understand the power company expects of it. In other words, if it is understood that the company will run the transformer at a load equivalent to 3 kva. continuously their design is such that the transformer will not overheat under this condition. Other manufacturers have a different idea, and the result is that a purchaser cannot know at present which transformer of those offered is the best at the price quoted. It is also questionable whether any manufacturer understands the requirements well enough to furnish a transformer to give the greatest return on the investment. Certainly there is no agreement between the companies as to requirements, if the resulting designs are any indication.

The factors affecting design of transformers are fixed by the investigation as stated in the following list:

A. Load cycle
B. Insulation requirement
C. Regulation necessary
D. Tap requirement
E. Cost of materials and labor
F. Characteristics of the iron
G. Cost of energy

Pertinent suggestions and criticisms are contained in the conclusion of the bulletin. Among these are:

The design of a transformer for a particular service can only be satisfactorily developed through the co-operation of those having complete information on the operating requirements and the designers who understand how to build the transformer to have the corresponding characteristics. A co-operative study of this kind is necessary for the small distribution transformers in view of the increased use of them occasioned by the building of new rural service lines. That the present designs are not consistent is apparent from the data presented in this bulletin.

There has been some discussion of late relative to fixing rates on the basis of connected transformer capacity. The lack of agreement as to the nominal rating of a transformer would seem to make this impracticable with the present type of transformer.

A study of the operating characteristics and weights of the competitive transformers reveals a striking dissimilarity. Data as to operating requirements are not available and consequently there can be no definite statement as to which design is the better.

The weights of some of the transformers may advantageously be reduced by using small steel cases and less oil. Some study should be made of the additional cost to the power company in installation and maintenance of heavy transformers.

A reasonable rate per kilowatt-hour in figuring losses should be determined.

The requirements of the different appliances, etc., in the matter

of regulation should be found. This affects greatly the manufacturing cost of a transformer.

The operating characteristics that limit the rating of a 1.5-kva. transformer should be fixed. This requires that temperature rise, regulation, iron loss and copper loss be specified.

The bulletin closes its admirable study on transformers for rural distribution with the suggestion that the particular requirements of city distribution might justify a similar study of transformers for this type of service.

Standardized Power-Factor Metering

By J. I. Whitney
Superintendent Meter Department, Vermont Hydro-Electric Corporation, Rutland, Vt.

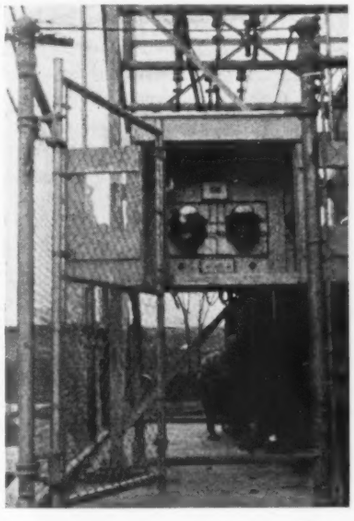


Fig. 1—Primary meters at plant of Rutland Fire Clay Company

FOR the past five years the Vermont Hydro-Electric Corporation and Rutland Railway, Light & Power Company have maintained a primary schedule of rates involving bonus and penalty power-factor clauses as follows:

"If the average power factor for the month is above 95 per cent 1 mill per kilowatt-hour will be deducted from the entire kilowatt-hours consumed during that month. If below 80 per cent, but above 70 per cent, 1 mill will be added per kilowatt-hour. If below 70 per cent, 4 mills will be added per kilowatt-hour. If below 50 per cent, company may discontinue service."

In order properly to meter such installations so as to avoid errors in hook-ups and calibration it is necessary to use a standard method on all primary metering installations. These installations are made up of two meters, one to measure energy and the other, by the use of an auto-transformer, to measure reactive volt-ampere hours. From the reading of these two meters used in connection with Fig. 3 the average power factor for the month or any other period of time may be obtained.

Fig. 2 shows our standard method of connections for these meters. All primary metering equipments are wired in the shop and it then requires but a short time to connect the primary side and mount the boxes on the job. By wiring the transformers and meter boxes in the shop better results are obtained, for probably in no phase of metering is orderliness more essential than in the wiring of meter installations involving metering transformers. Test blocks are used in order to make testing work on meters a simple matter.

Each step of this work is standardized and a careful check made for correctness of each connection. Wiring work done in the field often results in wrong connections

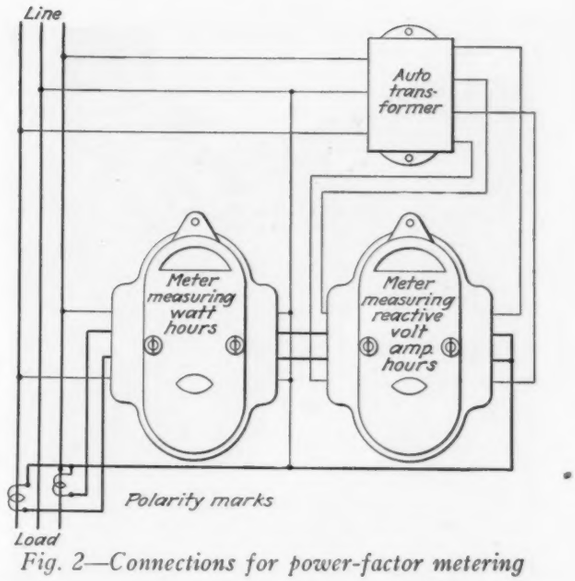


Fig. 2—Connections for power-factor metering

which cause serious errors in metering, and since the watt-hour meter is generally tested independently of the instrument transformers the error may last for a long period of time unless suspicion is aroused from a general knowledge of the installation.

It is the practice of this company not to fuse potential transformers on circuits of 6,600 volts or less for the reason that these fuses in order to be effective as a protection to the transformer might necessarily be of very small wire; as a result these fuses frequently open the circuit either mechanically or due to current above normal. The loss of a fuse means the loss of registration of one element of the watt-hour meter. In a polyphase installation it is difficult to detect this loss from the total registration, particularly with loads of inductive characteristics, and the condition might go unnoticed for a considerable period of time, with consequent loss of revenue.

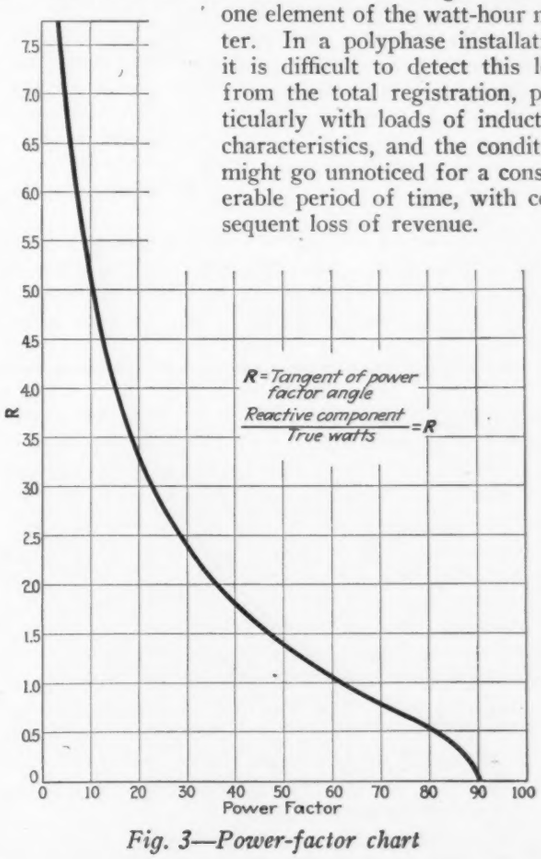


Fig. 3—Power-factor chart

Western Red

Survey of wood operations and pole production. Characteristics of Western red cedar timber. Discussion of seasoning, shrinking and checking

Flumes are often used to bring the poles from the mountains to transportation points

UTILITY companies use about 3,000,000 wood poles each year and the demand for poles is on the increase. Wood pole lines have a large place in the economical development of utility systems and an adequate supply of pole timber is a major industry consideration. Under present economic conditions the purchase and use of wood poles is an engineering problem and hit-or-miss purchasing on a price basis alone should be a practice of the past.

A change in the wood pole situation has been brought about because timber for poles has been practically used up in some regions, because preservative treatments are applied to wood poles, because the insulation value of wood is used to its fullest extent and because wood pole lines are now designed on an economic and engineering basis. Wood is relied upon as never before, and in order to measure the value of different wood poles in a given line it is necessary to study wood, preservation, costs, insulation, physical properties and strength and to solve an economic equation in which these factors are properly weighed.

Wood pole users have felt the effects of the past and present practices of the lumber industry. Starting in the

Rafts of poles are towed to rail points in many sections

WOOD POLES are important to the economic development of good electric service. The purchase and use of wood poles is receiving serious consideration in the utility industry for several reasons.

Some species of trees formerly used for wood poles in certain regions are gone from the market and the species proposed as substitutes are not well known in these regions. The pine of the South and the Western red cedar, Douglas fir and Lodgepole pine of the far West offer the future supply of poles and each species will find its economic place.

A second influence is the development and use of preservative methods for wood poles and the technical and economic considerations involved in wood-pole preservation.

A third influence is the use of wood pole insulating values and strength values for building lines to give improved service to customers.

A fourth influence is the business and cost elements which are involved in the purchase and use of poles under the commercial conditions that prevail at this time.

The author of this article has spent several weeks in field studies on Western red cedar poles and in this series of articles presents first-hand observation and data on this type of pole for utility service. Last year a similar series of articles discussed Southern pine poles and future issues of ELECTRICAL WORLD will have other articles from time to time about wood poles and wood-pole treatments that appear of national importance.

Cedar Poles

East, this industry is now looking out over the Gulf of Mexico in the South and over the Pacific Ocean in the West—having reached the limiting boundaries of its activities. Yet because of commercial demoralization, wasteful practices in lumbering operations are being continued and the complete exploitation of the virgin forests of this country is almost accomplished. This great economic crisis in the utilization of our timber resources has reacted to disturb the wood pole situation in some sections. In the South and in the Northwest timber is still available to supply poles for many years. The pine of the South grows rapidly and reaches pole size in 35 to 50 years, but the trees of the Northwest are of slower growth. The enormous stumpage that still exists and the excellent reproduction in protected areas permit Western red cedar timber to be counted upon as a pole supply in future years. Perhaps in eight or ten years Northern white cedar and chestnut will have disappeared over the pole horizon and the new supplies of pine, fir and cedar must fit into their economic fields of application in the regions where the other timber was formerly used for wood pole lines.

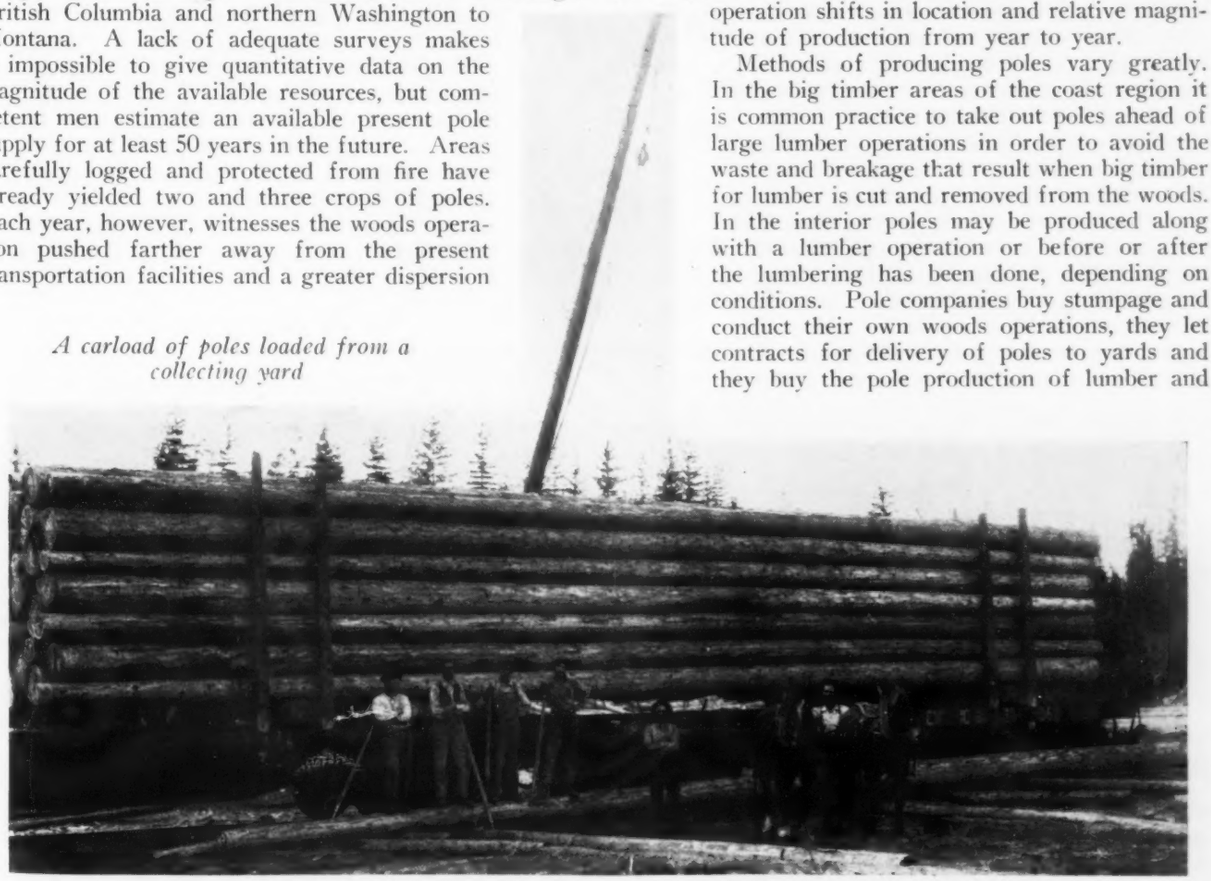
A felled cedar pole with tools used to remove bark

Cedar Pole Production

The Western red cedar (*Thuya plicata*) is a tree that grows from northern California through the Cascades of Oregon and Washington to Alaska, eastward through British Columbia and northern Washington to Montana. A lack of adequate surveys makes it impossible to give quantitative data on the magnitude of the available resources, but competent men estimate an available present pole supply for at least 50 years in the future. Areas carefully logged and protected from fire have already yielded two and three crops of poles. Each year, however, witnesses the woods operation pushed farther away from the present transportation facilities and a greater dispersion over the territory. About 25 years ago it might be said all cedar poles were produced within a radius of 150 miles of Spokane, but today this radius is 500 miles.

Probably half the cedar poles now come from British Columbia and half from the United States, but the woods operation shifts in location and relative magnitude of production from year to year.

Methods of producing poles vary greatly. In the big timber areas of the coast region it is common practice to take out poles ahead of large lumber operations in order to avoid the waste and breakage that result when big timber for lumber is cut and removed from the woods. In the interior poles may be produced along with a lumber operation or before or after the lumbering has been done, depending on conditions. Pole companies buy stumpage and conduct their own woods operations, they let contracts for delivery of poles to yards and they buy the pole production of lumber and



A carload of poles loaded from a collecting yard

A hewed slide or chute for getting poles out of the mountains

other companies. Production requirements are difficult to adapt to market requirements, however. All cedar stands have trees of different sizes and heights, but the market fluctuates in its demand as to size of pole, so that there may be considerable variance between yield and demand of certain sizes. Woods operations are conducted in winter and in the early summer. The market demand is usually at a peak during the summer period. This makes it impossible to get thorough pole seasoning and treating in the same year. Statistics on market demands are difficult to get and the consumption of poles cannot be predicted with accuracy. Difficulties in production require the carrying of enormous yard stocks. These elements make it difficult to stabilize pole production.

Woods operations are of many kinds. The spectacular high line lumbering method is used in the big timber of the coast, but in the mountains usually the poles are obtained by less spectacular methods. Logging teams drag the felled poles to skidways or collecting points and any convenient transportation method is used to bring the poles from the mountains to the concentration yards on the railroads. Flumes, streams, greased chutes, tractors and logging wagons are used, depending on the equipment used in the region and the environment of the production area. In the Spokane region a large quantity of poles is produced by woods operators under contract to the pole companies. These men, with small crews, operate in very rough country and production is surrounded with every difficulty that a mountain region and a variable climate can encompass. In wet weather roads are impassable; in winter no operations are economical because of snow and experienced labor is difficult to get and to keep, yet during 1928 nearly 1,000,000 Western red cedar poles are expected to be produced in this area by the 30 or 40 pole companies engaged in the production and sale of these poles. The total 1928 production is expected to be more than 1,300,000 poles.

A visit to the mountains to observe the labor and hardship involved in pole production is needed to give evidence that breakage, time delays, the distances to be covered, the great assortment of poles on a given acreage and the rough terrain all combine to make pole production a laborious job with small margin of profit.

After the poles are cut in the woods they are trimmed, the bark is removed and they are then collected at favorable points on skidways. From the skidways they are taken to permanent or temporary yards that are convenient to rail or water transportation. Seasoning occurs during all this period and some sorting is done when the poles are inspected for shipment at the collecting yards. Shipments from collecting yards are made to treating yards near Spokane or Minneapolis. These shipments are made after the poles are fairly well seasoned and in dry weather, if possible, in order to save shipping weight and consequently higher freight charges.

Cedar Wood Characteristics

A Western red cedar tree that has survived in a forest has done so under competitive conditions. For a hundred years or more it has grown up fighting storms, winds, snow, sleet and the climatic variations encountered in its environment. And thus when it is cut for use as a pole it represents a well-tried-out stick of timber.

Cedar poles in cross-section show an outside circumference, from $\frac{3}{8}$ in. to 1 in. thick, of a light-colored wood

A skidway in the mountains where poles are collected to be transported to the railroad

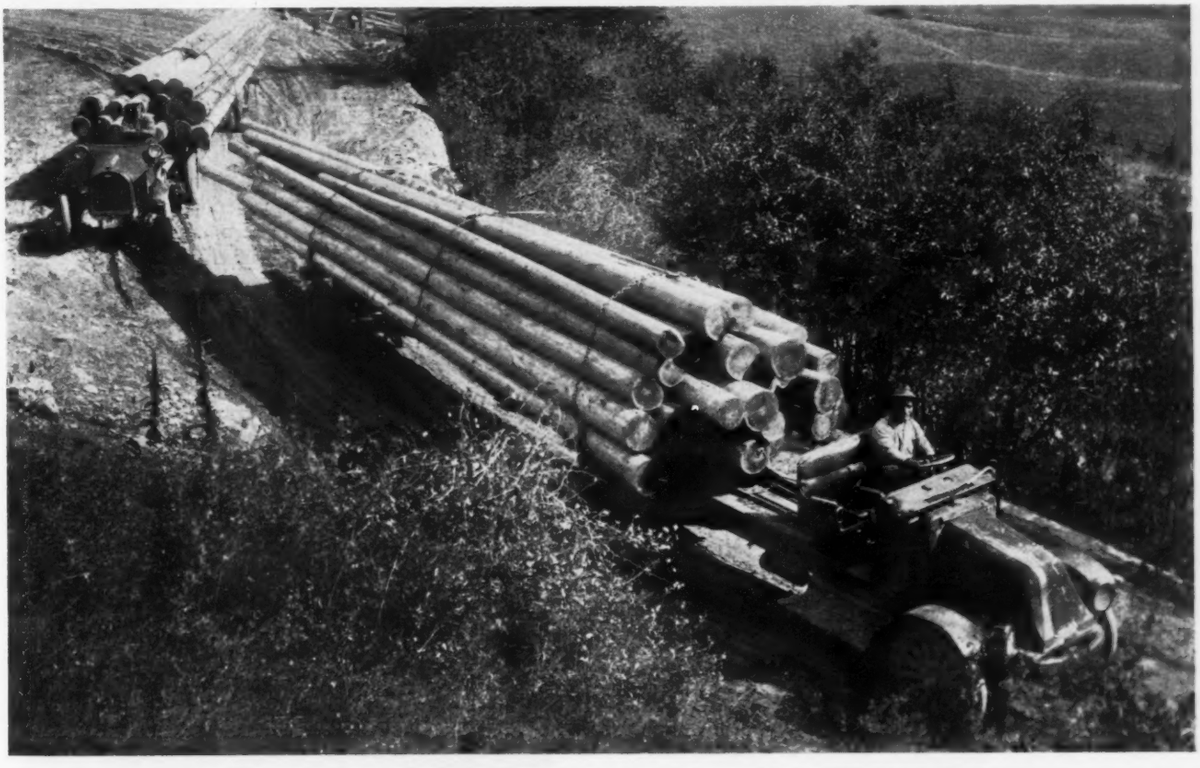
called "sapwood" and a central portion with the characteristic red color, called "heartwood." The heartwood and the inner sapwood are inactive, because the active cells which carry on the life processes are very near the inner bark in that part of a tree called the cambium. Some kind of oxidation process occurs to give the color characteristic of the heartwood, and color is the chief visible differentiation between this heartwood and the so-called sapwood.

The cedar tree in cross-section is made up of a series of concentric circular layers, each of which represents the growth during one year. In any cross-section the width of the annual growth rings may vary from year to year. Each ring is made up of an inner, softer, lighter colored portion, resulting from spring growth, and an outer, firmer, darker colored portion, resulting from summer growth. These are caused by differences in rate of growth because of different nutrition conditions in the seasons of a year. The cells of the cedar wood appear in cross-section as a honeycomb with cavities or lumens surrounded by cell walls. About 90 per cent of the wood is made of spindle-shaped cells called tracheids, which are tapered, tubular in construction, closed at each end and overlap with one another at the ends. About 10 per cent of the wood is made of blunt end, short cells joined end to end, with their major axis at right angles to the tracheids and disposed in the planes of the radii. These structures are called the medullary rays. All the cells of both kinds have thin places in their walls called pits. In the tracheids these pits are numerous and circular in outline. They permit of osmotic communication between cells through their partitioning membranes. Under the microscope Western red cedar wood makes a pattern of cells, membranes and valves marvelous to see.

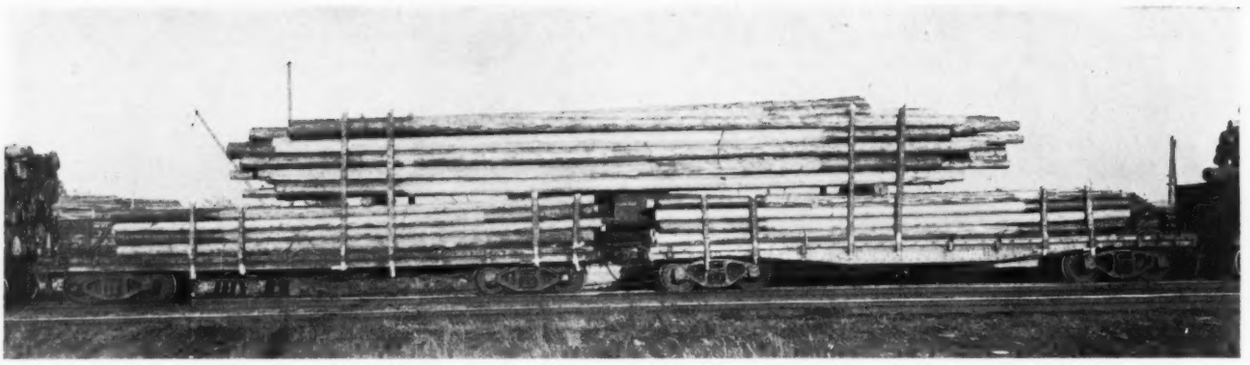
As a tree grows the sapwood changes gradually to heartwood, and at this period the cells have matured and the sugars and starches have mostly disappeared from their cavities. The cell walls become infiltrated with essential oils, gums and resins which act by oxidation and chemical changes to preserve the wood and give the characteristic red color. The cavities of the mature cells in the heartwood are filled largely with air and water and the pit valves in the cell walls are closed tightly, preventing the regular communication between cells.

Seasoning of Poles

One great difference between a tree and a pole is the moisture content in the wood. A living tree needs much water. A freshly cut pole has water in three forms or places. The cavities in the cells and the spaces between the cells contain free water, the cell walls and wood substance contain absorbed water and there is chemically combined water in the wood substance. Seasoned poles are those in which all the free water and some of the absorbed water have been removed. When a pole is seasoning the free water moves outward and evaporates on the surface and the only effect is loss in pole weight. Some of the absorbed water also disappears and the removal of absorbed water introduces all the difficulties incident to drying wood. The dividing line between free and absorbed water depends on the humidity of the air surrounding the wood and temperature conditions. The fiber saturation point, which is the dividing line between absorbed and free water, corresponds approximately to 30 per cent moisture. A pole will give off or take on water, depending upon its surroundings, and this leads to shrinking, checking and warping because of the internal stresses set up. Stresses permeate the entire pole structure, and while the drying of wood makes it resistant to decay it also sets up shrinkage stresses that can be re-



Trucks and tractors are used frequently to haul poles to collecting yards



Method of shipping long and short poles to customers after butt treatment

lieved only by resupplying the absorbed water that has been lost in seasoning or by rupturing the fiber structure. Wood takes up and gives up moisture and shrinking occurs only after the moisture content falls below the fiber saturation point. Checking occurs after shrinking begins and is the method by which the wood relieves internal stresses. If the outside of the wood dries faster than the inside, and this is the case in dry air and in open air, the outer layer shrinks and stresses become so great that the fibers break along their length, giving rise to checks or cracks. In most instances these checks are small and well distributed, but in other instances the stresses are relieved as a result of one or more large checks.

Shrinking and consequently checking are inevitable in a wood pole subjected to moisture variations and dried below the fiber saturation point. This is because wood cells or fibers shrink greatly in cross-section as compared to the shrinkage in length. Shrinkage of a pole along a unit of the diameter is half as much as along the same unit of the circumference. Checks close up when a pole is wet, but open again when a pole dries. Well-distributed checks have little or no effect on pole strength or length of life.

Defects in Cedar and Inspection Methods

Defects found in cedar are readily observed by inspectors when trees are cut and trimmed—cat's faces and ring and butt rots are visible. Experienced inspectors can readily tell whether a tree with some evidence of rot in the butt should be used as a pole. Standard association and purchasing specifications eliminate all badly twisted or badly warped poles. Appearance alone prohibits the use of this kind of cedar for utility lines.

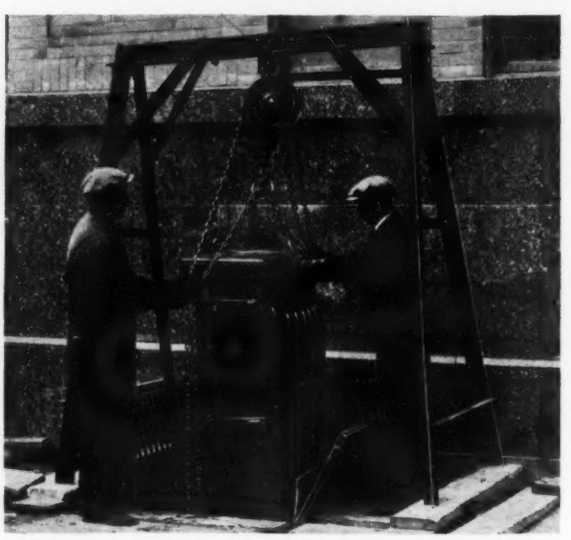
But Western red cedar as a whole is a very uniform and healthy timber and a given stumpage produces a uniform lot of poles with good taper and practically free from defects. The few defective poles are caught and eliminated and the future health of the inspected timber can be relied upon because it does not rot readily or quickly. After cutting, trimming and the first inspection the chief hazard to a pole is a chance of bruising, breakage in or chafing in handling—all these may make mechanical defects in some poles and necessitate the use of an inspector at least when poles are shipped and just before they are treated.

Untreated cedar poles have a useful life that varies in different localities. It takes air, moisture, food supply and heat to sustain the fungus growth resulting in so-called rot and these conditions prevail in varying degrees at the ground line area where poles are located. The sapwood cells are the first seat of rot because they are on the outer circumference, are very susceptible and are the first to be exposed to the fungi, while the heartwood has a very high degree of natural resistance to decay. Thus the life of an untreated pole is largely determined by the time required to rot the sapwood at the ground line—then the appearance of the pole is against the further use even though the sound heartwood would resist rot for a much longer period of time. The time required for untreated sapwood to rot depends upon the four factors that sustain fungus growth and figures from 7 to 24 years show the variation in life that may be expected. Rot can be eliminated and a second article will be printed shortly in which the preservatives of cedar are discussed from a technical and economic point of view.

Chain-Block Support for Lowering Transformers

By W. L. Mitzinius

Assistant Superintendent of Construction
New York & Queens Electric Light & Power Company



TO LOWER equipment into areaways and basement or subway transformer vaults the New York & Queens Electric Light & Power Company is utilizing the chain-block support illustrated. The main members consist of 3-in. angles braced with 2-in. angles. The horizontal member is a 4-in. I-beam. This frame is used for loads up to 2 tons. It has been in service about three years and has been found to be safe and very practical device.

American Control of Foreign Utilities

International diversification in utility operation and ownership achieved by American & Foreign Power Company Inc. American methods introduced abroad

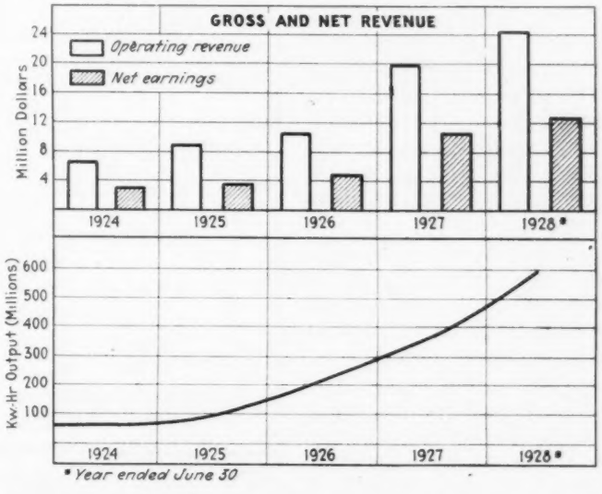
THE pioneer adventure in the administration of public utility systems in foreign lands by the American & Foreign Power Company Inc. is a corollary of America's transition of a little more than a decade ago from debtor to creditor nation. American capital during the decade has been poured into the development and rehabilitation of foreign industry by the billions. Like some other American industrial enterprises this company has gone a step farther than merely investing abroad and has reached out to supervise and develop a system of properties there. In this the American & Foreign Power Company Inc. stands virtually alone so far as the utility field is concerned.

One naturally inquires why the group sponsoring this enterprise went so far afield while so many properties remained undeveloped nearer home. The sound economies of the general principle of diversification as applied to the utility industry had been so well proved within the United States that the Electric Bond & Share executives conceived the idea of extending the same principle abroad. By 1923 the company had acquired properties in Panama, Guatemala and Cuba; a holding company was organized to take over these properties and to promote their development in co-operation with the parent company. These were the small beginnings of an enterprise which, although still under five years old, has assumed an important place in the public utility industry of the United States, an enterprise with assets well over a quarter of a billion and gross earnings around $25,000,000 annually, which will be increased to more than $53,000,000 when certain properties newly acquired or in process of acquisition are taken over.

Evolution of Capital Structure

After the first year of operation changes were periodically found advisable in the structure of the American & Foreign Power Company Inc. In 1924 many of the properties of companies in Cuba which were then owned, except the street railway properties, were leased to the Compania Cubana de Electricidad, Inc. During this year, however, the latter company was dissolved and all its properties and the properties that had been previously operated under lease were acquired by the Compania Cubana de Electricidad, which is controlled by the Havana Electric & Utilities Company. The railway properties, in the meanwhile, had been sold. In the interval opportunities for utility development in other Latin-American countries and elsewhere were studied. These investigations resulted in the purchase outright or the acquisition of control of properties in Brazil, Colombia, Venezuela, Ecuador and elsewhere and minority holdings of companies interested in properties in France, Japan, Argentina, Canada and other countries.

The South American Power Company was set up as a holding company for most of the situations in this new group and on a share exchange basis its securities were later turned over to the American & Foreign Power Company Inc. Subsidiaries of the South American Power Company operate properties supplying electric power and light and street railway service to many important communities in Brazil, including Bahia, Petropolis, Victoria, Curityba and Porto Alegre. Electric power and light service is supplied in other Brazilian cities, including Nictheroy, Ribeira Preto and Sao Goncalo. In addition telephone systems are operated in several districts in Brazil and gas is manufactured and distributed in Porto Alegre. Electric power and light properties are operated in Barranquilla, Colombia; in Guayaquil, Ecuador; in Caracas, Venezuela, and in certain other countries in Central and South America. In addition South American Power Company has investments in companies in countries outside of South and Central America.



American & Foreign Power system shows steady growth in earnings and power production

Last June the company acquired the securities of the Mexican Utilities Company on an exchange basis for its $6 preferred stock. The Mexican Utilities Company controls the Guanajuato Power & Electric Company and subsidiaries. In addition to the above-mentioned properties arrangements have been made for the purchase of important utility properties in Chile and Mexico formerly controlled by the Whitehall Electrical Investment, Ltd., London, but the properties will not be taken over until early in 1929.

The aggregate gross revenues of these properties is around $15,000,000. Chilean properties to be acquired

include electric power and light and street railway systems in Santiago and Valparaiso. The New Mexico properties include power and light systems in Vera Cruz, Tampico, Puebla and Orizaba, street railway properties in Vera Cruz and Puebla and a wholesale power and light business in Cordoba.

Financial Structure Is Simple

With the consummation of this latter exchange the company emerged with its financial structure considerably enlarged and relatively simple. On June 30, 1928, it had 1,246,392 common shares and option warrants for common shares equivalent to 3,070,768 shares, 471,496 shares of $7 preferred stock, 1,168,432 shares of $7 second preferred stock, series A, and 35,759 shares (including scrip) of $6 preferred stock. Additional stock which could be issued on payment of subscriptions included option warrants for common stock equivalent to 4,005,264 shares, 7,504 shares of $7 preferred and 600,969 shares of second preferred, series A. The surplus at that date was $5,749,063.

Owing to the relative newness of the company the officers have been unable, so far to put into effect many of the policies generally followed by the Electric Bond & Share Company in connection with holding company activities. That company normally carries out a program, on behalf of its associated companies, which embraces for each operating company's territory served the organization of a new operating company which acquires in fee the properties of companies already in existence. The older companies are then dissolved and their securities for the most part are retired. This makes it possible for the new operating company to start out with a modern financial structure and one which facilitates future financing at a favorable rate and under favorable conditions. The program also embraces the tying together of physical properties by transmission lines whenever practical, the building of modern generating substation and other properties, the scrapping of smaller inefficient plants and the rebuilding of some of the older plants that lend themselves to the task for use as standby plants. As soon as the company is in a position to finance itself and to give service by reason of enlarged and improved facilities every effort is then made to build up load and get all the business that it is possible to get.

Same Policy Followed Abroad

The policy just outlined is that followed by the Electric Bond & Share Company in the United States and the same policy will be followed in foreign countries. The extent of operations in Guatemala and Panama is, of course, limited as compared with other situations and as the properties in these countries have been owned for the longest period greater progress has been made. In both of these countries the financial structures of the respective companies have been worked out and, following the usual custom, stock has been sold locally to customers and the general public. There has usually been substantial success in the sale of this stock. The company has also been successful in building up the load of the respective companies and in the sale of electric energy-consuming devices. Electric ranges, for example, have found great favor in these countries.

In respect to conditions in Cuba the physical properties practically cover all the important communities on the island and the properties have been tied together in two principal operating groups. There has also been a merger of the companies and the proper financial structures worked out, but owing to the temporarily unfavorable economic conditions existing in Cuba the securities of the new company have not been sold, but are being carried by the holding company. As soon as conditions warrant, steps will no doubt be taken to sell stock of the operating company in the various communities served by the new company, while senior securities will be sold through investment dealers.

Little progress has been made in this direction by the parent company in the other situations under discussion. The work in these countries is still in what may be called the acquisition stage. Additional properties are being acquired and as opportunity permits extension of lines is being made in a small way and efforts are being made to increase load. The policy followed in these countries when the time comes will be the same as the policy usually followed by the parent organization.

Controlled Companies at June 30, 1928

Panama Power & Light Corporation
Compania Panamena de Fuerza y Luz
Havana Electric & Utilities Company
  Compania Cubana de Electricidad
Empresa Guatemalteca de Electricidad, Inc.
Empresa Electrica del Ecuador Inc.
Mexican Utilities Company
  The Guanajuato Power & Electric Company
  Central Mexico Light & Power Company
South American Power Company

Brazilian Companies

Companhia Brasileira de Energia Electrica
Companhia Linha Circular de Carris da Bahia
Empreza Forca e Luz de Ribierao Preto
Cia Paulista de Forca e Luz
South Brazilian Railways Co., Ltd.
Companhia Energia Electrica Rio Grandense

Colombian Company

Compania Colombiana de Electricidad

Mexican Company

Compania de Electricidad de Merida, S. A.

Venezuelan Company

Compania Anonima Venezolana de Luz

Company's Operating Policy Abroad

With regard to the actual method of operating foreign properties, the Electric Bond & Share Company usually sends engineers, accountants, rate experts, commercial men and representatives of other departments from the United States to assist the local operating forces. Whenever possible it follows the policy of retaining and utilizing, as fully as possible, the staffs of the companies acquired. The members of these staffs know the properties; they know the people in the respective territories and they know existing conditions. What most of the companies in these foreign situations have needed has been financial assistance to take care of increased business and extension of service.

Some difficulty is occasionally encountered in the foreign countries as a result of backward legislation in certain directions. The laws in many of the Central and South American countries are not so modern as those in the United States in respect to the public utility operations and consequently the company is frequently handicapped from these conditions. Progress has been made, however, in getting the laws adjusted to more modern methods and needs, especially in Cuba.

100,000 Range Customers *in Five Years*

A Statement by
R. H. BALLARD
President Southern California Edison Company

R. H. Ballard

SPEAKING before a recent meeting of 200 district managers and sales representatives of the Southern California Edison Company, President R. H. Ballard clearly outlined the problem before his commercial department in selling 2,000 electric ranges in a 60-day campaign. He said: "The greatest piece of work confronting the company and the company's future prosperity is the business of scientifically and properly building up the load, and that is the purpose of this sales conference. The year just past has shown such remarkable results as to give us the courage to think that even our own estimates for the next five years will be vastly exceeded.

"During the past five years the Southern California Edison Company has spent approximately $138,000,000 in development work and the estimate for the next five years is $130,000,000. However, there is a great distinction between the two five-year budget amounts in that in the next five years three-fourths of the money to be spent will be devoted to the idea of getting new business as compared to one-fourth spent for that purpose during the past five years.

Economic Distribution of Ranges Desirable

"Engineers bear me out in the idea that the most economic basis of operation for the electric range, taking it from the standpoint of the power system, is to have a diversified business to the extent of about one range to each four customers, thereby avoiding too much general expenditure going into the system without the corresponding immediate return.

"If we should lay out an electric range sales program for a period of five years, we will say, in that time domestic customers will easily increase by 140,000, making the total on the Edison system 500,000. In some of our districts we now have a range to each seven domestic customers, but if we should become really enthusiastic about the business and really get down to it, get our hearts into it, we can have a range to each five customers at the end of five years. In that event we should have 100,000 ranges five years from now. We now have 15,000 range customers, which leaves 85,000 still to be sold.

"The quota I would set, were I running this campaign, is 17,000 ranges per year on the average. By that I do not mean that in the next twelve months we will sell 17,000 ranges, but if we sell 10,000 in the next year, the momentum, the advertising value of those 10,000 new ranges—the lady who tells her friends what she does with her electric range—will bring a whole lot of ranges that we will not have to sell; they will just sell themselves.

"This might mean that we would sell 10,000 ranges the first year and end up with 30,000 the last year, but no matter how the bogey is divided, it is within the power of this sales organization to accomplish the task. I always like to beat estimates. When I am making them myself for my own performance I always make them low. But when I am making them for my organization, I set them at just exactly what I think it can do if it sets out with determination and has within it the heart and spirit of the men who are directing the work, and of all of the executives who are lending their support. The thing to do is to do this job, with the organization as a whole unified and correlated, just in the same way that we have built up a great engineering and operating organization. And so it is with building a range load of this magnitude: Let us make this a great Edison campaign; let us have no separation between the commercial department and the company. None as such really exists, none should exist, and every man in the commercial department can rely upon the whole-hearted support of Mr. Miller, your chairman, of myself and of every executive of the company."

When leading executives like R. H. Ballard set a five-year range sales program such as he has set for his commercial organization and are willing to back it up with financial support, they are putting the load-building problem squarely up to the commercial man, and it is up to him to measure up to the job.

While Mr. Ballard's remarks were addressed primarily to his own sales organization, they so clearly reflect the trend of executive thinking that they should be an inspiration to all commercial men.

Pulling Trench Sheathing

By Theodore R. Eilenberg
Structural Engineer New York & Queens Electric Light & Power Company

TO REMOVE trench shoring the New York & Queens Electric Light & Power Company is using the lever-type sheathing puller illustrated. The horse, which is made of yellow pine, measures 7 ft. 6 in. long by 3 ft. 2 in. high. A clearance of 5 ft. 2 in. between legs permits the horse to straddle a trench conveniently. This horse is built of heavy timbers, the cross-member being 6 in. x 8 in. and the legs 4 in. x 4 in. The top piece is rounded so the lever will roll over it easily. Clear white oak 13 ft. long and a cross-section tapering from 4 in. x 6 in. to 4½ in. square is used for the lever. The pulling end is reinforced on all sides with ¼-in. steel plates. A ½-in. chain 4 ft. long is attached to an eyebolt at pulling end of levers and is furnished with a grab hook on one end to permit adjustment in length.

Loose Laminations a Source of Trouble

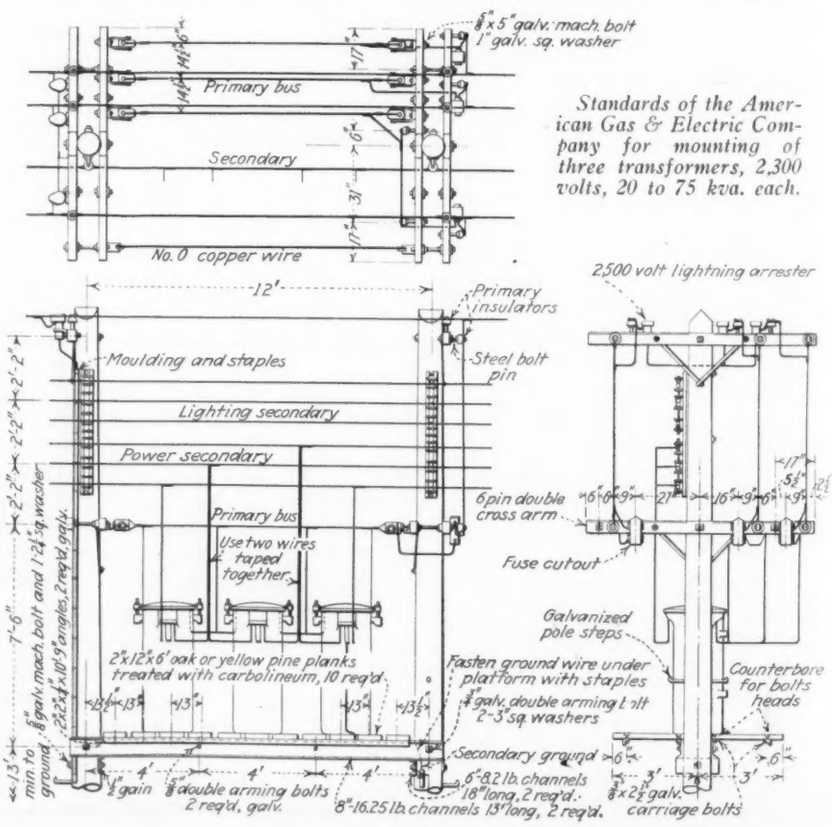
IN A New England central station trouble with a 1,250-kva., 2,300-volt, three-phase, 60-cycle generator with a double delta barrel winding was traced to loose laminations after considerable investigation. The station operators reported hearing frequently a noise resembling a static discharge in the direction of the machine and they observed a streak of fire the entire distance around the armature. This would last for a few seconds and then stop. Nothing could be found wrong on visual inspection. The trouble occurred several times during the day at no regular time.

The static discharge theory was felt to be far fetched, as no cause could be assigned for its building up. The machine was shut down and the insulation meggered and found to be in good condition. It was then thought that the difficulty might be due to the generation of static charges within the machine. Going on the theory that it was static, even though it was impossible to explain how it was generated, an attempt was made to drain it off to ground. This was done by connecting the primaries of three small transformers in star and grounding the artificial neutral so formed, as the machine winding was double delta, therefore having no fixed neutral. This did not remedy conditions in the least, so it was decided to make a minute investigation of the machine and it was shut down for that purpose at the first opportunity.

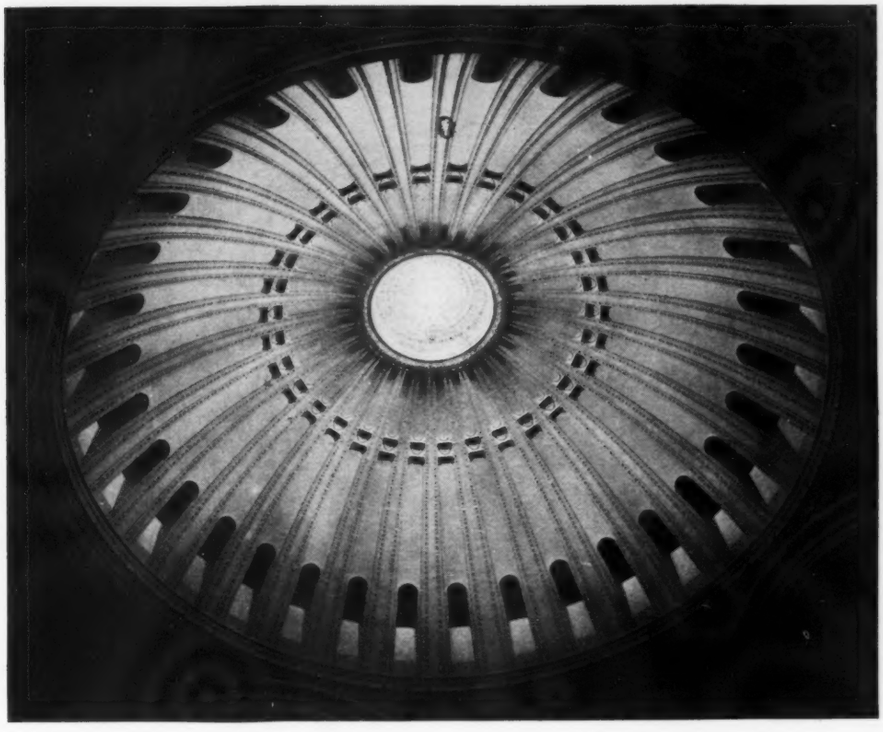
When the armature was jacked away from the field and a thorough examination made it was found in one row of tooth laminations near the center air duct of the core that, due to the tooth wedges springing, looseness had resulted, and that the 60-cycle vibration had caused crystallization of the metal at the base of the tooth and probably 30 had broken off. As each one broke, the revolving field magnetically pulled out the broken lamination into the air gap and the friction of this lamination carried around by the field against the armature iron was responsible for the noise and sparks. As the machine had malleable wedges it was difficult to put in a filler in the space of the missing laminations and get any pressure, but it was done as well as possible under the circumstances.

In the repair work the laminations and wedges were pressed together with as much pressure as could be obtained by means of metal clamps and a fiber filler driven into place, corded and painted with insulating varnish. This repair was found to be satisfactory and the machine is still in service.

Platform Mounting of Distribution Transformers



Standards of the American Gas & Electric Company for mounting of three transformers, 2,300 volts, 20 to 75 kva. each.



Dome fully illuminated by concealed units

Relighting an Auditorium

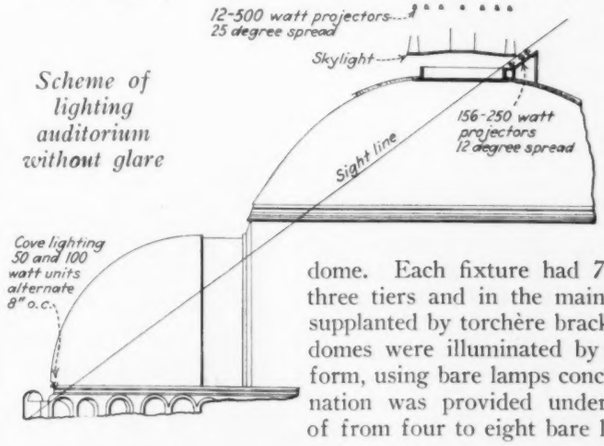
Floodlighting units supersede hanging fixtures in main auditorium. Intensity raised from 5 to 7 ft.-candles with 16½ watts per seat. Interesting problems in mounting reflectors

By L. F. KLEIN
M. B. Foster Electric Company, Boston

AFTER 22 years of service the lighting installation of the First Church of Christ, Scientist, at Boston, Mass., has recently been modernized to produce a standard of illumination hardly less than unique among religious edifices. Known as the Mother Church of this communion, the building has a seating capacity of 5,000 in its main auditorium and is generally considered to be one of the largest and finest churches in the country. The size and architectural arrangement caused many difficulties for the illuminating engineer and the problem of rehabilitation had been considered by various specialists for a period covering ten years prior to its actual undertaking.

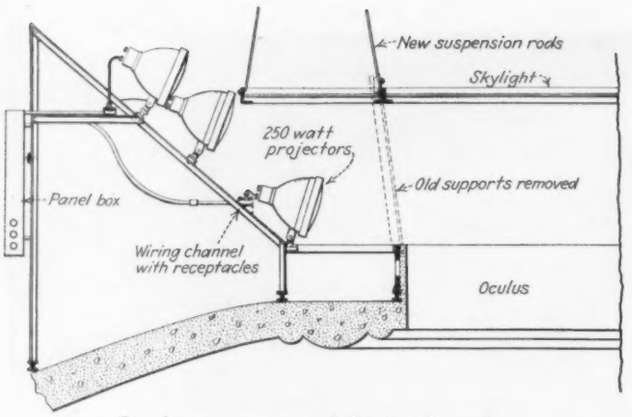
The central feature of the auditorium is a dome 108 ft. above the floor at its maximum height and 90 ft. in diameter at the cornice, although it continues to spread below this point until it reaches the same diameter as the height. Semi-domes 65 ft. in diameter are situated on each side of the main dome.

Extreme diffusion and a comparatively high level of illumination are necessary throughout the church, as the type of service requires the congregation to speak from various parts of the auditorium.


12-500 watt projectors 25 degree spread
Skylight
156-250 watt projectors 12 degree spread
Sight line
Cove lighting 50 and 100 watt units alternate 8" o.c.

Scheme of lighting auditorium without glare

In 1906 the auditorium was lighted by eight massive bronze chandeliers of the corona type which were suspended midway between the oculus and the edge of the dome. Each fixture had 73 32-cp. lamps arranged in three tiers and in the main auditorium their light was supplanted by torchère brackets on the walls. The semi-domes were illuminated by cove lighting in its earliest form, using bare lamps concealed in the cornice. Illumination was provided under balconies by ceiling units of from four to eight bare lamps each.



Projectors mounted back of oculus

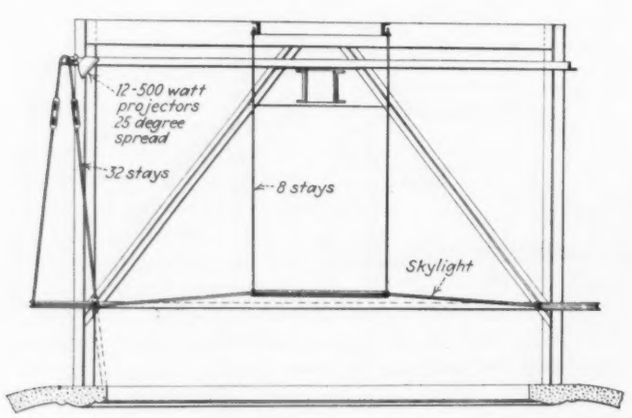
Several methods of illumination were considered in modernizing. Chief among these were cove lighting, the use of indirect fixtures, floodlighting from windows and dome and lighting directly through the glass skylight above the oculus. None of these, however, seemed to be entirely satisfactory.

In many instances it is necessary that the lighting be the result of a series of compromises, but, fortunately, the construction and type of this building were such that it was possible to find a solution correct from every standpoint.

Floodlighting was determined upon as the best method of illuminating the central area of the auditorium. The dome has an opening 18 ft. in diameter at the top. Approximately 30 in. above the oculus is a skylight, which from the floor appears to be on the same level as the top of the dome. The plan adopted consists of a new application of old lighting principles and might very well be termed "reversed indirect" lighting.

In the space between the top of the dome and the skylight, 156 250-watt projectors were installed below the line of sight, considered from the highest seating point in the auditorium. The area covered by the main dome contains approximately 8,800 square feet. The projectors throw light upon the plaster of the dome and from there it is reflected throughout the auditorium. Flexibility was achieved by the use of small projectors of the 250-watt size with a beam spread of 12 deg. These were wired so that one-half, three-fourths or full illumination can be used at any time.

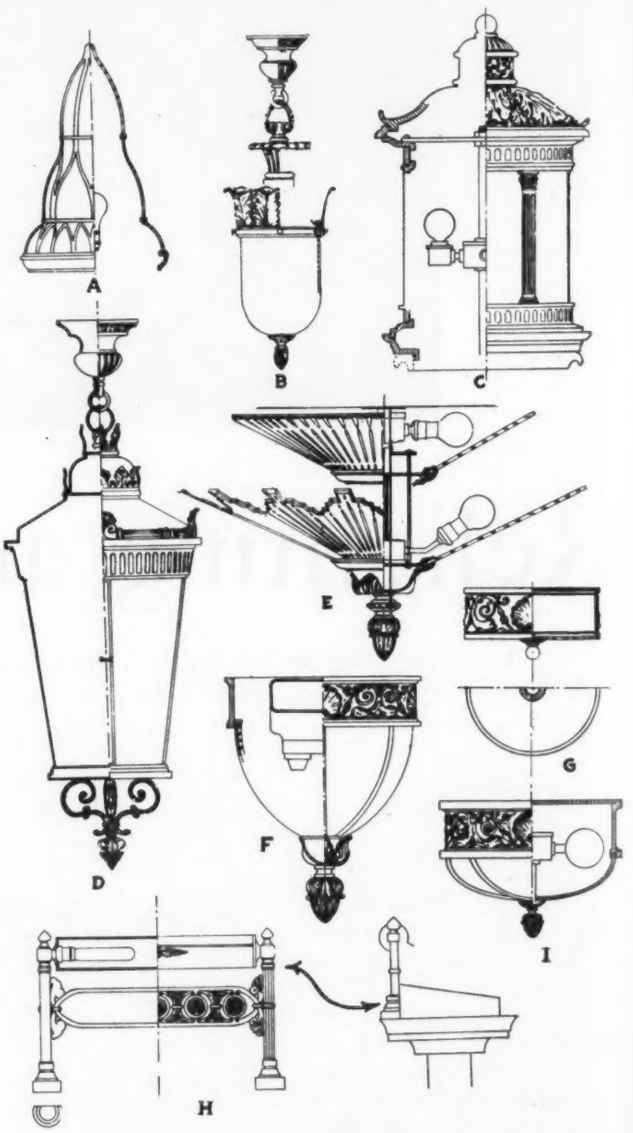
The projectors are mounted in three tiers. Those in the bottom row illuminate the top portion of the dome. The wiring is carried from the former remote-control



Method of suspending glass and mounting projectors above oculus

switches to a general distribution panel and from there to four fuse panels. Each circuit carries not more than three lamps and the projectors are plugged into 20-amp. receptacles which are mounted on "Curtistrip." Because the use of this wiring channel obviated the necessity of cutting, threading and bending pipe, a much lower labor cost was realized than would otherwise have been possible, and flexibility was also gained for possible later adjustments and changes.

Each projector and receptacle is labeled with its circuit number. The projectors are adjustable both vertically and horizontally and after the proper adjustment

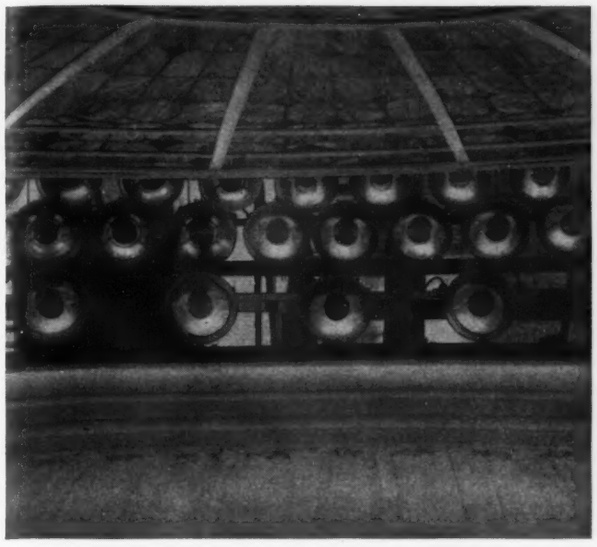


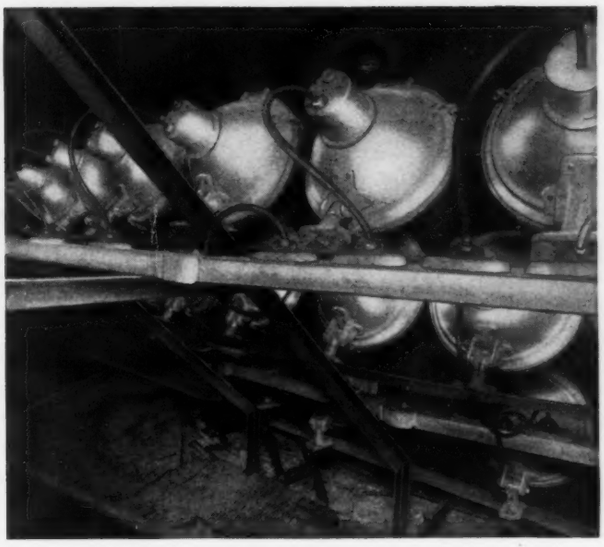
Types of luminaires used

E—Crystal sunburst in vestibule, 480 watts; I—120-watt unit, under balconies; C—pedestal top on platform, 200 watts; D—100-watt exterior luminaire.

was made markers were placed across the movable parts so that the adjustment could be readily regained if lost through vibration or other cause.

In order to intercept the line of sight, it was found desirable to extend the diameter of the skylight glass to 23 ft. The spill light from the projectors around the glass did not suitably illuminate it, as it should be made visible by transmitted light. Accordingly, the type of glass used was changed to one of rather high diffusion





Segment of projector banks back of oculus and close-up of projector mounting back of oculus

and, by experiment, twelve 500-watt units with 25-deg. beam spread were found suitable to give the proper brightness to the underside of the glass. These were installed above and around the edge of the glass so that each projector illuminated the opposite side.

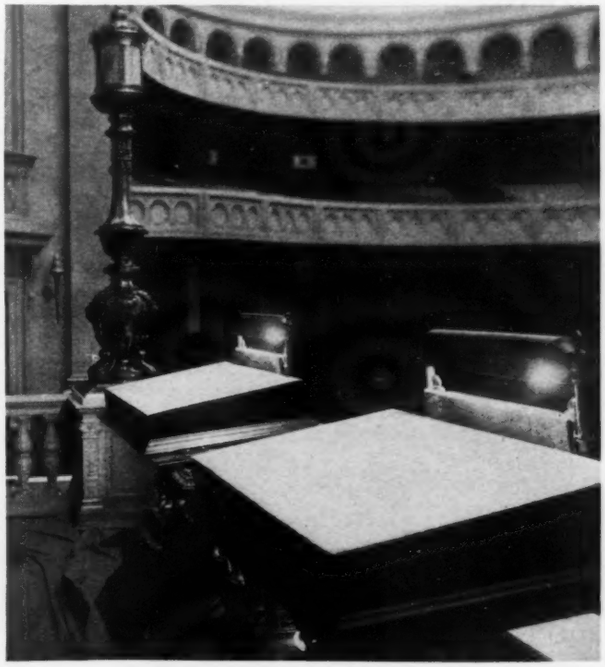
The semi-domes are lighted by adapting the original outlets to the change by the addition of standard square "Curtistrip" receptacles, with specially formed outlet box covers shaped to the correct angle for proper tilt of the reflector. Silver mirrored reflectors were mounted on these receptacles with alternating 50- and 100-watt lamps spaced on 8 in. centers. The appearance of the semi-domes illuminated by cove lighting closely resembles that of the main dome with the floodlighting coming from above.

The various illustrations show the methods of installation and the resulting effects.

In addition to this work of floodlighting and cove lighting a total of 303 luminaires was needed for use in vestibules, balconies, stairways, readers' desks and other locations. The designs were created by an artist who spent three weeks studying the details of the building. Unusually effective designs were the result.

New tops were installed on the pedestals of the reader's platform and the torchère brackets, and these successfully eliminated the glare from the old units. On the standards, a new lantern top replaced the glaring lamps previously in use and a conventionalized plain top supplanted those on the wall brackets.

The units for the readers' desks are a great improvement over other existing types. A double cylinder construction controls the light and makes possible the adjustment of intensity. At the same time it prevents any glare reaching the eyes of the reader or congregation;



Cove lighting units installed around semi-dome and reading desks fitted with two 60-watt lamps each

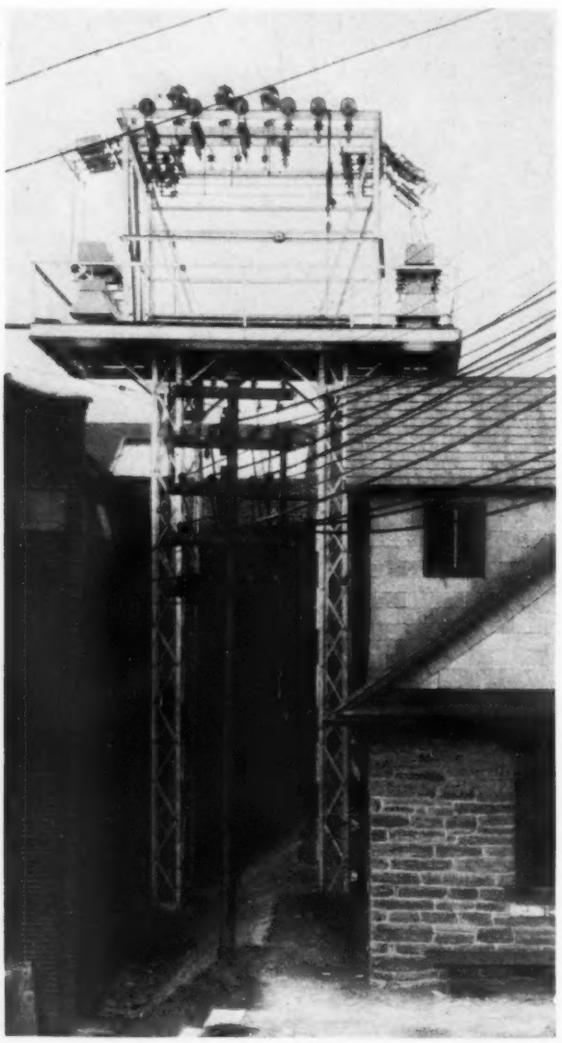
in most cases the dimensions of the luminaires were larger than called for by standard practice for the lamp used and in no case were they smaller.

The unusual results obtained from this installation bear witness to the advance that has been made in recent years in the control of light. An illumination level of 7 ft.-candles is maintained on the floor of the auditorium and the whole installation is entirely free from glare.

In conclusion, a few engineering notes are presented. The intensity of illumination in the auditorium was formerly about 5 ft.-candles. The present connected lighting load is 82.3 kw. including auditorium, galleries, auxiliary rooms, corridors, etc., but the energy consumption for lighting is not available as no separate metering has been installed. Service is supplied by the Edison Electric Illuminating Company of Boston to the church establishment, including its publishing house adjacent to the main edifice. The total cost of the rehabilitation was about $45,000, of which the cost of work in the main and semi-domes, wiring, structural steel, leaded glass, reflectors, projectors and "Curtistrip," excluding lamps, totaled $19,250 and luminaires redesigned and replacing obsolete equipment $25,350. Tests of the reflection factor of the plaster under soiled conditions averaged 20 per cent after 22 years' service without cleaning, and under reasonably clean conditions this rose to 48 per cent, and in some locations to 63 per cent.

The engineering service was furnished by the illuminating engineering department of the Edison Electric Illuminating Company of Boston, under R. B. Brown, Jr. The lighting equipment was manufactured by Curtis Lighting, Inc., Chicago, and the electrical construction was by the M. B. Foster Electric Company, Boston, under the supervision of Karl Anton Piez, resident engineer of the Curtis company.

Substation Straddles Pole Line



FOUR overhead and three underground 13,000-volt lines supplying power to the Llanerch (Pa.) station of the West Chester Railway Company terminate in a high-level outdoor substation. Space limitations did not permit the more usual types of construction. The station was built by the General Electric Company.

Cost of Street Lighting Changeover

A COMPREHENSIVE estimate of the cost of substituting 391 gas-filled incandescent series street lamps for the same number of magnetite arc lamps at Lowell, Mass., was recently prepared by the Lowell Electric Light Corporation in connection with proceedings before the Massachusetts Department of Public Utilities. These lamps serve the downtown center and average about 51 ft. apart. The arc lamps are of the "White-Way" type, consuming 528 watts each, the incandescents being rated at 600 nominal candlepower and at 340 watts each. The total estimated cost of the changeover was $19,796 gross, or, less salvage, $18,379 net. The company's itemized cost estimate is as shown in the accompanying table.

Itemized Cost Estimate, 391 Magnetites to 391 Novalux

(Cents Omitted)

Cost of New Equipment f.o.b. Stockroom:		
6 34-kw. constant current transformers	$2,810	
391 600-cp. street lighting units complete (340 watts each)	12,695	
10 600-cp. street lighting units, spare	306	
Alternating-current ammeters with instrument transformers	339	$16,150
Cost to Install:		
Constant current transformers	150	
Lamp equipment (labor and transportation)	518	
Ammeters and instrument transformers	60	728
Engineering, supervision, contingencies	2,531	2,531
Cost of new equipment installed		$19,411
Cost to Remove Arc Lamp Equipment:		
Labor and transportation	259	
Cost to remove station equipment	126	385
Total cost of change, gross		$19,796
Salvage Credit:		
391 magnetite lamps, 528 watts each	586	
10 magnetite lamps, spare	15	
Station equipment	816	1,417
Net cost to city		$18,379
Net cost to city per active lamp replaced		$47

Expect to Stimulate Year-Round Decorative Lighting

AN INTERESTING innovation in the way of a merchandising campaign is that in which the Pacific Gas & Electric Company is now engaged in selling 4,000 Christmas lighting sets. While the sale of these sets will cost the company nothing and the revenue of 17 cents for ten days burning is comparatively insignificant, the campaign has a broader purpose. By placing 4,000 lighting sets in the homes of its domestic customers dur-

Italian Practices that Affect American Export

Excerpts from an Address by

DR. JULIUS KLEIN
Director U. S. Bureau of Foreign and Domestic Commerce

MUSSOLINI is not merely a poseur, but knowing his people's inclination to follow personalities rather than principles, he is utilizing the position of dictator to obtain some results which are of value.

* * *

An important essential of his program is economic self-sufficiency. He indicates that Italy needs not so much political independence of the individual as economic independence of the nation.

* * *

His program presupposes an excessive amount of government intrusion in business, but with exceptions this is not taking place.

* * *

Establishment of a trade balance between imports and exports is a basic theme of his commercial operations. He has changed his country's excess of imports over exports from 51 to 35 per cent.

* * *

Among the obstacles which he is encountering are: Currency stabilization (70 per cent compared with 92 per cent for some other nations); the tendency for the higher exchange rate to increase imports; unemployment (although reduced almost 35 per cent); immobility of labor; reduction of immigrant remittances (immigration reduced almost 75 per cent), and reduction of tourist traffic because other than the wealthy budget their expenses very closely.

* * *

A $500,000,000 public works program, largely agricultural, is intended to help overcome the unemployment situation. A program to increase the amount of arable land may be expected to afford Americans an additional market for machinery and equipment.

* * *

Regarding American commerce, 10 per cent of the exports of Italy come to this country, making us the second largest market. On the other hand, our exports to Italy have increased practically 100 per cent since 1913 ($132,000,000), making us rank first as compared with third in 1913. Our exports to Italy constitute 20 per cent of our export value.

* * *

Italy is making treaties with the Balkans and the Near East, and is also courting South America. Practically one-third of the population of Argentina is composed of Italians, and Brazil has a million Italians. Because of the migration of agricultural labor regularly, each year, between Italy and South America, Italy is implanting in South America its Fascist ideas, which will be very difficult to eradicate.

The most lucrative field in South America is along the southeast coast line.

* * *

While Italy's exports to Argentina are only one-third of our exports to that country (ours are 27 per cent of our output), they are growing.

* * *

Italy has had an amazing development in its water power, now possessing 2,300,000 hp.

Since 1913 its kilowatt-hour consumption has quadrupled (now 8,000,000,000 kw.-hr.), which makes Italy a very interesting electrical equipment market to watch, especially for industrial plants,

ing the early part of December, 1928, the company expects by proper follow-up to develop an all-year use of decorative lighting on holidays and for various home festivities throughout the year, thus gaining in revenue on other occasions.

The sets are of the seven-light, multiple type and are being sold without the aid of advertising entirely through employees. The price is $4.50 cash or payable in 30 days with the customer's lighting bill. On each sale the employee receives a commission of $1. The purchase and sale price and the commission are such that the company will break even on the deal and at the same time gain a valuable entrée to the home for future follow-up and sale of other energy-consuming devices.

Selecting Metal-Melting Pots

BY B. M. RIKER*
Industrial Heating Engineer
Charles H. Tenney & Company, Boston

AS A rule, metal melting can be handled satisfactorily by standard equipment. Well-established lines of pots on the market at present embody the types shown in the accompanying table.

In new applications demanding special pots complete information should be obtained as to the kind of work to be done and the handling methods, with the size, length, top and bottom widths and depth of pot required, shape,

**From James H. McGraw N.E.L.A. prize essay, 1928.*

Type	Capacity, Lb.	Kilowatt Rating	Control	Shape	Maximum Operating Temperature, Fahrenheit
Bench (portable)	10	0.5	Three-heat	Round	950
Bench (portable)	30	1.3	Three-heat	Round	950
Floor (portable)	150	5.2	Automatic	Round	950
Floor (portable)	350	10.0	Automatic	Round	Babbitt 950–Lead 1,650
Floor (portable)	750	15.6	Automatic	Round	Babbitt 950–Lead 1,650
Floor (semi-portable)	1,500	25.0	Automatic	Round	Babbitt 950–Lead 1,650
Floor (stationary)	3,000	45.0	Automatic	Rectangular	Babbitt 950–Lead 1,650
Floor (stationary)	5,000	75.0	Automatic	Rectangular	Babbitt 950–Lead 1,650

and the metal composition to be melted, weights to be melted, fluxes used, whether water or acid is to be evaporated, the daily hours and uniformity of operation and period of maximum work if any.

Tangible Value of Better Window Lighting

By Victor W. Hartley*
Chairman Commercial Lighting Committee, Pacific Coast Electrical Association

COMMERCIAL managers interested in better store and window lighting will find actual results of a lighting sales test made in Long Beach, Calif., of particular value. As part of its 1927-28 program the commercial lighting committee of the Pacific Coast Electrical Association arranged to make tests in four California cities to determine the true value of commercial lighting campaigns to all parties concerned in the transaction.

The first step in the campaign was the selection of a store wherein the existing lighting represented the general average in the community. After the owner had been convinced of his needs for better illumination and had agreed to have an installation made according to specifications prepared by the committee a check was made, as is customary in tests of this nature, of the percentage of passersby who stopped to look into his windows, as they were lighted at the time. With these figures at hand the installation was then revised and a similar check made under the new conditions.

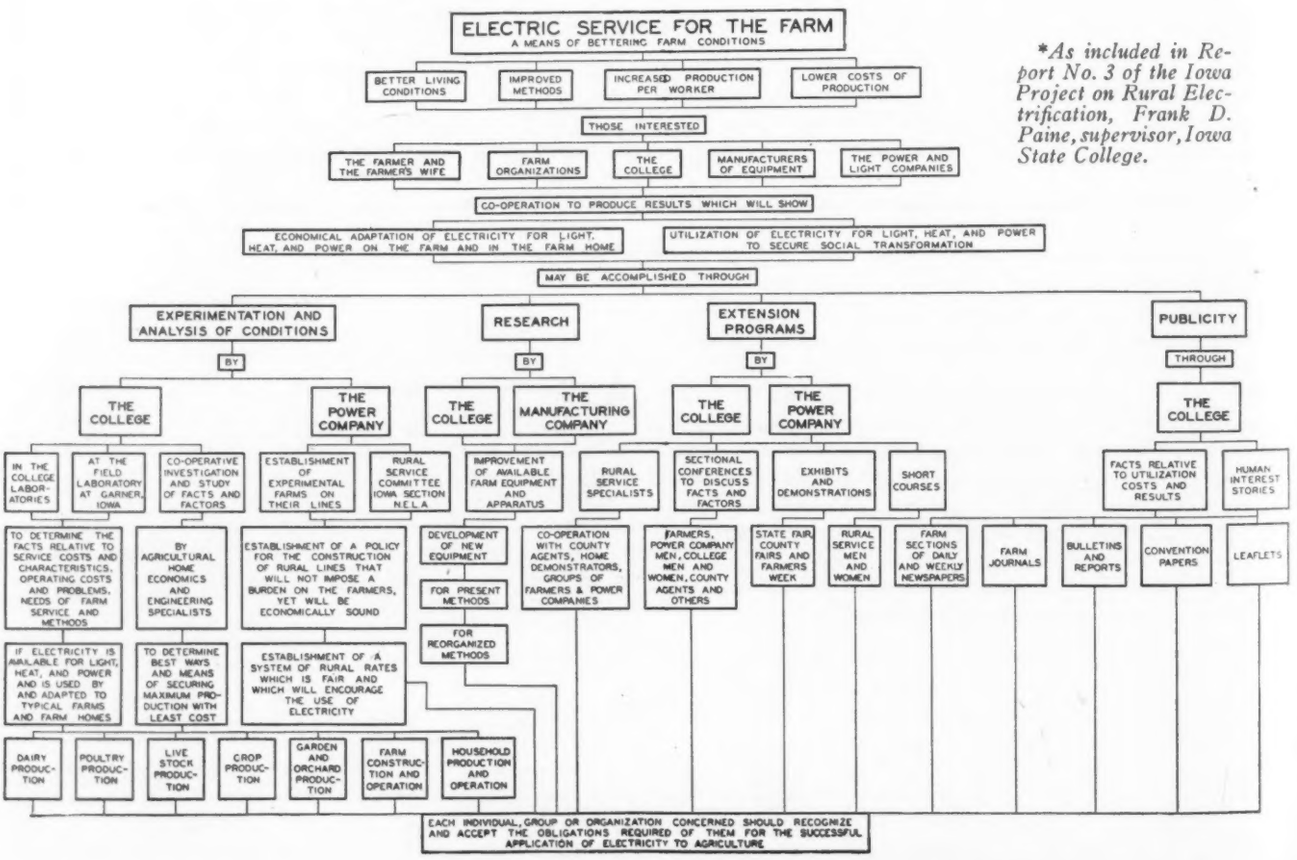
Executive secretary California Electrical Bureau, San Francisco, Calif.

Old Installation		
Windows	Six 200-watt units	Total 1,200 watts
Interior	Three 300-watt units	Total 900 watts
Decorative and auxiliary lighting		None
Average monthly revenue	Twelve months prior to change	$20.00
New Installation		
Windows	Sixteen 150-watt units	Total 2,400 watts
Interior	Nine 200-watt units	Total 1,800 watts
Workroom	One 300-watt unit	Total 300 watts
Office	One 100-watt unit	Total 100 watts
Decorative and auxiliary lighting	Two duplex convenience outlets in windows Six duplex convenience outlets in interior	
Average monthly revenue five months since change		$43.00

Under the original lighting the average percentage of passers who were attracted to the window was 17.5 per cent, the poorest night showing only 10.3 per cent and the best night 20.1 per cent. Under the improved conditions the average was 46.8 per cent, with a low of 44.9 per cent and a high of 48.7 per cent. In other words, where the windows had a drawing power of less than one passer-by out of every five the higher standards of illumination attracted nearly every other person who passed.

Similar improvements in the general atmosphere of the store under the new illumination and consequent increases in business have thoroughly convinced the merchant of the important part illumination plays in successful merchandising. While the test has not progressed sufficiently to give truly comparative figures regarding the increase in his business over a long period of time the merchant freely volunteered that "if any merchant

Rural Electrification Program for Iowa*


ELECTRIC SERVICE FOR THE FARM
A MEANS OF BETTERING FARM CONDITIONS
BETTER LIVING CONDITIONS
IMPROVED METHODS
INCREASED PRODUCTION PER WORKER
LOWER COSTS OF PRODUCTION
THOSE INTERESTED
THE FARMER AND THE FARMER'S WIFE
FARM ORGANIZATIONS
THE COLLEGE
MANUFACTURERS OF EQUIPMENT
THE POWER AND LIGHT COMPANIES
CO-OPERATION TO PRODUCE RESULTS WHICH WILL SHOW
ECONOMICAL ADAPTATION OF ELECTRICITY FOR LIGHT, HEAT, AND POWER ON THE FARM AND IN THE FARM HOME
UTILIZATION OF ELECTRICITY FOR LIGHT, HEAT, AND POWER TO SECURE SOCIAL TRANSFORMATION
MAY BE ACCOMPLISHED THROUGH
EXPERIMENTATION AND ANALYSIS OF CONDITIONS
RESEARCH
EXTENSION PROGRAMS
PUBLICITY
BY
THROUGH
THE COLLEGE
THE POWER COMPANY
THE MANUFACTURING COMPANY
IN THE COLLEGE LABORATORIES
AT THE FIELD LABORATORY AT GARNER, IOWA
CO-OPERATIVE INVESTIGATION AND STUDY OF FACTS AND FACTORS
ESTABLISHMENT OF EXPERIMENTAL FARMS ON THEIR LINES
RURAL SERVICE COMMITTEE IOWA SECTION N.E.L.A.
IMPROVEMENT OF AVAILABLE FARM EQUIPMENT AND APPARATUS
RURAL SERVICE SPECIALISTS
SECTIONAL CONFERENCES TO DISCUSS FACTS AND FACTORS
EXHIBITS AND DEMONSTRATIONS
SHORT COURSES
FACTS RELATIVE TO UTILIZATION COSTS AND RESULTS
HUMAN INTEREST STORIES
TO DETERMINE THE FACTS RELATIVE TO SERVICE COSTS AND CHARACTERISTICS, OPERATING COSTS AND PROBLEMS, NEEDS OF FARM SERVICE AND METHODS
BY AGRICULTURAL HOME ECONOMICS AND ENGINEERING SPECIALISTS
ESTABLISHMENT OF A POLICY FOR THE CONSTRUCTION OF RURAL LINES THAT WILL NOT IMPOSE A BURDEN ON THE FARMERS, YET WILL BE ECONOMICALLY SOUND
DEVELOPMENT OF NEW EQUIPMENT
FOR PRESENT METHODS
FOR REORGANIZED METHODS
CO-OPERATION WITH COUNTY AGENTS, HOME DEMONSTRATORS, GROUPS OF FARMERS & POWER COMPANIES
FARMERS, POWER COMPANY MEN, COLLEGE MEN AND WOMEN, COUNTY AGENTS AND OTHERS
STATE FAIR, COUNTY FAIRS AND FARMERS WEEK
RURAL SERVICE MEN AND WOMEN
FARM SECTIONS OF DAILY AND WEEKLY NEWSPAPERS
FARM JOURNALS
BULLETINS AND REPORTS
CONVENTION PAPERS
LEAFLETS
IF ELECTRICITY IS AVAILABLE FOR LIGHT, HEAT, AND POWER AND IS USED BY AND ADAPTED TO TYPICAL FARMS AND FARM HOMES
TO DETERMINE BEST WAYS AND MEANS OF SECURING MAXIMUM PRODUCTION WITH LEAST COST
ESTABLISHMENT OF A SYSTEM OF RURAL RATES WHICH IS FAIR AND WHICH WILL ENCOURAGE THE USE OF ELECTRICITY
DAIRY PRODUCTION
POULTRY PRODUCTION
LIVE STOCK PRODUCTION
CROP PRODUCTION
GARDEN AND ORCHARD PRODUCTION
FARM CONSTRUCTION AND OPERATION
HOUSEHOLD PRODUCTION AND OPERATION
EACH INDIVIDUAL, GROUP OR ORGANIZATION CONCERNED SHOULD RECOGNIZE AND ACCEPT THE OBLIGATIONS REQUIRED OF THEM FOR THE SUCCESSFUL APPLICATION OF ELECTRICITY TO AGRICULTURE

As included in Report No. 3 of the Iowa Project on Rural Electrification, Frank D. Paine, supervisor, Iowa State College.

ever wishes to know what improved lighting can do toward building up his sales, refer him to me and I can remove all doubt from his mind by reciting my own actual experience."

What did the change mean to the power company? The accompanying tabulation shows the increased wattage necessary to bring about these desirable standards and indicates the consequent increase in revenue.

Summarizing, it is found the job increased from a total of 2,100 watts to a total of 4,600 watts connected, with eight duplex convenience outlets for the additional load of floor or counter lamps, and in considering the revenue increase of 115 per cent from $20 per month to $43 per month, it should be remembered that the five months covered by the figures were summer months and the average for the year will undoubtedly be even higher.

One very obvious result in the Long Beach case as well as the others which are sufficiently far advanced to produce results has been the public relations angle: that is, the good will toward the power companies, created among the merchants because of the interest thus shown by the power companies in the merchant's problems.

Louisville Bids for Business

"THE principle behind scientific plant location is simple — find the locality offering the greatest number of factors favorable to low-cost production and combining nearness to principal markets," states a booklet recently issued by the Louisville Industrial Foundation in boosting that Kentucky city.

"Louisville has been making remarkable industrial progress during recent years because of a combination of advantages which are briefly described and illustrated in this booklet 'Louisville,'" according to R. Montgomery, general sales manager of the Louisville Gas & Electric Company.

The topics treated cover geographical and census data, market possibilities, transportation factors, potential manufacturing economics, sources of raw materials, financial facilities and social and civic conditions. The booklet is attractively printed on high-grade paper and is available for distribution among industrial men who may be interested in the locality.

Letters from Our Readers

Grounding Conference in New York

To the Editor of the ELECTRICAL WORLD:

Several years ago the editor of the ELECTRICAL WORLD stated in a brief editorial article that "Grounding substituted excess current values for excess voltages."

This fundamental principle of grounding seems to have been entirely overlooked in your recent report of the grounding conference, and it is possible that in quoting my remarks at the convention your representative did not grasp this fundamental idea that I desired to convey to the utility interests, namely:

"That excessive currents over ground connections should be taken care of on the street side of the service switch and not over accidental or intentional grounds within buildings served with current."

Since your article appeared several engineers who attended the convention have requested that I write to you and explain this very important feature of the discussion.

GEORGE WELMAN,
Chief Electrical Inspector.
Louisiana Rating and Fire Prevention Bureau,
New Orleans, La.

Experiences of a Householder

To the Editor of the ELECTRICAL WORLD:

Two experiences I had within the past month with two different electrical companies showed such a striking contrast that they seemed to me to be an object lesson in one phase of electrical merchandising.

Almost at the same time the electrical washing machine and the electric carpet sweeper in use in my home began to fail. They had been bought at nearly the same time. When the lady of the house complained I tried to diagnose the complaint and concluded that the motor of the washing machine was defective. I tinkered the carpet sweeper up as best I could, but could do nothing.

I advised her to ask the washing machine company to send a mechanic to see the defective motor. A few days later a salesman called. He started the motor, watched it sparking for a few seconds and then advised that the washing machine was worn out and that the only thing to do was to trade it in and buy a new one.

I questioned him a little, found out that he was no mechanic, got rid of him quickly, pulled the motor off myself, found a nameplate on it telling who made the motor, took it to them and found out that it was dirty. They cleaned it, put it back on the machine at a cost of a few dollars and the machine works as well as ever.

The following week my wife was examining electrical appliances in a big store and asked the salesman about putting more modern brushes and suction apparatus inside her carpet sweeper. "I have the kind of carpet sweeper you are selling," she explained, "but an older model, and I'm not satisfied with it. I didn't buy it here."

The salesman took her name and address and two days later was up to the house to examine the sweeper. "Even though I didn't sell it, I can't let any one be dissatisfied with the kind of sweepers we sell," he explained. The belt on the sweeper was stretched and worn out and half a dollar paid for the new belt he put on, since when the sweeper has run perfectly.

"I felt sure you would tell me it was worn out and I had better trade it in," my wife commented, recalling the washing machine man's visit.

"Oh, no, madam," he said. "You haven't nearly got the years of service out of that sweeper which you are entitled to, and if an appliance will not give the length of service it is supposed to give we do not want to sell it. Any apparatus we sell is going to give just as much and as long service as the advertisement promises, and we are out to see that it does, whether you actually bought it from us or not."

And the consequence was that the washing machine company lost a customer and a friend, while the other man gained both. For I can neither patronize nor recommend a firm which sends a salesman when I want a mechanic and takes advantage of my lack of technique to try to sell me a new machine unnecessarily, but I will send all my friends to buy from the fellow who is out to give real, honest-to-goodness service, to see that my appliances do what they are supposed to do, and to see that I don't spend $50 when 50 cents will do the job.

Montreal, Que. A. E. PERKS.

Digest of Electrical Literature

Generation, Control, Switching and Protection

Paugan Falls Generating Station.—The mechanical and the electrical features of the latest of the three plants recently completed on the Gatineau River, Quebec, are described in this article. The drainage area of this plant is approximately 9,100 square miles and an average flow of nearly 10,000 sec.-ft. can be maintained throughout the year, according to preliminary estimates. This station is designed for an ultimate installation of 272,000 hp. in eight units of 34,000 hp. each, but with provision for a possible installation of fourteen units. The effective head is 132 ft. and the waterwheels are of the vertical-shaft, single-runner Francis type, operating at 125 r.p.m. — *Electrical News (Canada)*, Dec. 1, 1928.

Generating Station Extensions.—A number of additions and extensions to British generating stations have been made recently, and an indication of the general trend in steam station practices in Great Britain is made in this article.—*Electrical Review (England)*, Nov. 23, 1928.

Hydro-Electric Development and Steam Equipment

Practice and Progress in Combustion of Coal as Applied to Steam Generation.—F. H. ROSENCRANTS.—A review expressed in fundamental terms setting forth the past development, the present position and the trend of progress as applied to pulverized fuel firing and stoker firing. The relative positions of pulverized fuel and stokers and of the "bin and feeder" system and the "direct-fired" system of pulverized fuel are considered in detail. The considerations governing the development of plant arrangement and of individual items of equipment entering into pulverized-fuel systems are discussed in the light of accumulated experience, the shortcomings and virtues of past designs being set forth. The combustion process in its relation to coal preparation and furnace and burner design is considered, and also the history of the pulverized-fuel furnace, beginning with solid refractory walls and terminating with the water-cooled and steam-cooled furnace. Improvements in stoker design and performance and the necessity of improving stoker furnaces so as to meet the modern requirements of rating, efficiency and preheated air temperature, also the factors defining the field of application of traveling-grate and retort type stokers, are dealt with. A brief discussion of the problem of ash and grit as discharged from the chimney and of the solution of this difficulty has been included. — *Journal of the Institution of Electrical Engineers (England)*, November, 1928.

Transmission, Substations and Distribution

Peak Load Control.—H. WILSON.—A distribution system so arranged as to control the peak load by means of relays fed from the street-lighting circuit is described by the author and the advantages of this particular system as well as of the general control of peak loads are pointed out. In the system described there is an extra conductor for street lighting in each of the three-phase, four-wire, distribution feeders and a similar supplementary conductor for the four main lines. The control of electric water heaters offers the essential element in the utilization of the off-peak features of this distribution system and by means of relay control of domestic equipment the desired results have apparently been obtained. The author also suggested that a proper relay control by means of the pilot wire system would limit the use of power for certain motors to off-peak periods and would entitle the user to a preferential rate. The plan is one which has been placed in practical operation in Great Britain, at least in so far as one community is concerned.—*Electrical Review (England)*, Nov. 16, 1928.

Overhead Electric Lines.—W. B. WOODHOUSE.—During the past few years the British Electrical and Allied Industry Research Association has been studying the materials and methods used in the construction of overhead electric power lines. The data available for the designer were found to be incomplete and unreliable and the information so far obtained has proved of immediate practical use and has led to further research, according to the author. The subjects taken up include the mechanical properties of wires and poles, and the effect of wind pressures. Some of these investigations were undertaken by means of a small scale model, but many of the tests are based on direct observation in the field.—*Electrician (England)*, Nov. 16, 1928.

Practical Uses of Steel and Concrete Poles.—As the result of a questionnaire sent to the principal utilities of this country a summary of practices throughout the United States in regard to steel and concrete poles, their installation, use and similar factors has been compiled. A supplementary statement in regard to the manufacture and application of concrete poles has been considered and certain conclusions regarding their advantages and disadvantages drawn. — *Report National Electric Light Association*, November, 1928.

Units, Measurements and Instruments

Lichtenberg Figures. — C. EDWARD MAGNUSSON.—By means of a generous number of reproductions of Lichtenberg figures, the author has pointed out characteristic indications and has indicated the possibilities of such a record form for various determinations. Experiments are also described which tend to prove that light is formed when the electric impulse travels over the plate surface and that light acts as the immediate cause for the formation of the photographic record. The sharpness of the figure outlined indicates that the light is produced at the surface boundary of the air with the photographic plates. Experiments are in progress to determine the effects on Lichtenberg figures for changes in air pressure. The size of the figures increases with reduction of pressure and the general structure, of especially the positive figure, changes greatly from the form produced by the given impulse in air at atmospheric pressure.—*Journal of the American Institute of Electrical Engineers*, November, 1928.

Reverse-Power Alternating-Current Relays for Three-Phase Generator and Feeder Protection.—G. E. TAYLOR.—A discussion of the behavior of reverse-power alternating-current relays of the wattmeter and allied types when applied to the protection of three-phase generators and feeders, showing the differences in behavior produced by various systems of connections; the improper operations inevitable with each system of connections; the difficulties to be overcome in order to produce a reverse-power relay which will be stable with all conditions of forward power and whose operation will yet be certain under all conditions of reverse power.—*Journal of the Institution of Electrical Engineers (England)*, November, 1928.

Illumination

The Influence of Illumination on the Working Efficiency of Man. — L. SCHNEIDER.—The author has concluded as the result of an investigation which involved numerous determinations, in connection with brightness and speed of perception for various contrasts and other factors in the mechanics of seeing, that all the factors comprising quality of illumination may have a decided influence on the working efficiency of man. It appears, according to the author, that the possibility of gradually bridging the still existing gap between a psychological and physiological aspect has advanced considerably. The results of a long series of determinations have been represented graphically for ready as-

similation and several different methods for securing specific information have been reviewed.—*Journal of Good Lighting (England)*, November, 1928.

Motors and Control

The Circle Diagram of the Induction Motor.—LAURENCE H. A. CARR.—It is stated that hitherto only two complete proofs of the circle diagram allowing for stator impedance and core loss have been published, those of Ossana's method of repeated inversion and Lamme's algebraic proof. Both of these methods are said to have disadvantages. The first is not readily available in English and the second is long and involved and often difficult to follow. It is further stated that neither of these methods gives any construction for the determination or graphic representation of the secondary equivalent current. The author has therefore offered a new proof with the alleged advantages of: Graphic proof throughout; an easy construction for the secondary equivalent current and where the secondary winding is not short-circuited for the secondary equivalent terminal electric motive force, and a symbolic method with approximations so exact that at any stage in a problem symbolic methods may be substituted for graphical methods, or vice versa, with full confidence that the values obtained by the two methods are in exact agreement. Application of the diagram to the synchronous machine is developed.—*Journal of the Institution of Electrical Engineers (England)*, November, 1928.

Heat Applications and Material Handling

Medium- and High-Frequency Generators.—K. SCHMIDT.—This discussion deals with the design of a new type of alternating-current generator for frequencies between 500 and 8,000 cycles. A growing demand exists for such machines to feed induction furnaces, high-speed induction motors, under-water telephony and radio purposes. In spite of keen competition with vacuum tube arrangements, the machine type of generator has held its own within the above range of frequencies. The new construction utilizes standard three-phase motor frames, has a very high frequency, uses a very inexpensive winding and can be built self-excited. Iron and copper are so efficiently used that a 500-cycle generator is actually smaller in size than a 50-cycle machine of equal output. Full design details are given for a 100-kw., 500-cycle, 1,800-volt, 1,500-r.p.m. machine, which shows an efficiency of 84 per cent. Characteristic curves and voltage oscillograms indicate the favorable performance of this generator, which is used for a brass furnace. Further data are given for a 2-kw. generator of 8,100 cycles at 4,500 r.p.m.—*Elektrotechnische Zeitschrift*, Oct. 25, 1928.

The Sullivan Electrolytic Zinc Plant.—U. C. TAINTON.—Electrolytic zinc produced at the plant described in this article is of 99.99 per cent purity and is obtained from ores which have been classified as not particularly favorable for electrolytic treatment, since they tend to form an unusually large amount of insoluble zinc ferrite. The process has been fully described and the electrical features of the equipment pointed out. While the consensus of opinion among electrical engineers apparently favors the installation of rotary converters, on account of their higher conversion efficiency, the metallurgists selected motor-generator sets because of their greater flexibility and freedom from interruption caused by line disturbances. To prevent the formation of deposits on the cooling system coils, in the electrolytic division, lead grids were placed between the coils and provision is made for connecting the whole system in series with the cell circuit so that 8,000 amp. can be passed through the solution from the grids to the coils at short intervals, resulting in plating a thin film of zinc on the coils.—*Engineering and Mining Journal*, Dec. 1, 1928.

Electrophysics, Electrochemistry and Batteries

The Characteristics of Impulse Generators and the Impulse Test of Lightning Arresters.—TEIZO ISSIKI.—Characteristics of the impulse generator using condenser discharge and considering the effects of spark potential drop at the discharging gap and the capacitance of the voltage measuring device as well as the test sample shunting the discharge resistance have been considered by the author. The results of a number of experiments for impulse voltage are offered and the performance of a lightning arrester when subject to the ordinary impulse test is compared with its performance for surge voltage on the transmission system. It is pointed out that the ordinary school of impulse test often gives false results, since the lightning arrester has considerable capacitance. A description of a new method in which impulse voltage is applied to the lightning arrester under test through an artificial line is said to give reliable indications of the performance of any lightning arrester for surges on the transmission system.—*Journal of the Institute of Electrical Engineers of Japan*, October, 1928.

Telegraphy, Telephony, Radio and Signals

Impedance of a Non-Linear Circuit Element.—EUGENE PETERSON.—Experimental determinations of the impedance of a variable element, such as an iron core coil worked at a high flux density, or a heavily loaded vacuum tube, are found to depend upon the impedance-frequency characteristics of the measuring circuit, as well as upon the complexity of the applied potential wave. The author has built up a picture of the action of a non-linear element in producing harmonics, and has demonstrated that the flow of harmonic current affects the measured impedance of the fundamental frequency in two ways, which are designated as the loading and reaction effects. The loading effect is not produced by the superposition of currents without any regard to production of new frequencies, and the reaction effect, in accordance with energy conservation ideas, is that due to energy storage and dissipation of harmonic frequencies which appear as impedance reactions at the fundamental frequency.—*Reprint B-319, Bell Telephone Laboratories, Inc.*

Miscellaneous

Strain Markings in Mild Steel Under Tension.—HENRY S. RAWDON.—In the course of the investigations described in this article polished tension bars were examined during the tension test to determine the stress and corresponding elongation at which strain markings appear. The mode of propagation of the strain effect throughout the bar was determined by repeated loadings on the same bar. Hardness was found to increase about 5 per cent during deformation of strain markings, this increase being about one-tenth that occurring when the same steel was stressed to fracture. Strain markings were found to result from deformation by slip within a relatively few suitably oriented ferrite grains. This slip was found to be accompanied by a general shifting and tilting of neighboring grains, however, which resulted in the characteristic rippled surface appearance of the strain markings on steel.—*Research Paper No. 15, Bureau of Standards.*

The Use and Interpretation of the Transverse Test for Cast Iron.—J. G. PEARCE.—The transverse test remains, according to the author, by far the simplest and most generally used test for cast iron. It is pointed out that it may be made with little expenditure of time on a simple unmachined bar and with a cheap and easily manipulated machine. Current methods of using the results of the transverse test do not yield the whole of the information that this test is capable of giving and the author has accordingly endeavored to suggest an alternative method of treatment. This is based upon the contention that the true criterion of transverse strength is the modulus of rupture determined for the actual bar section measured at the point of fracture. A special investigation of the discrepancy between the transverse results of the square and round bars of similar size has been analyzed and the results indicate clearly that the round bar is stronger than the square bar even when prepared from a bar originally cast square and that the square bar is weaker than the round bar even when prepared from a bar originally cast round.—*Engineering (England)*, Nov. 9, 1928.

News of the Industry

Boulder Dam Bill in President's Hands

It Passes Senate, as Amended, by 64 to 11 and House of Representatives by 166 to 122 Without Being Sent to Conference—Commissioner Mead's Views

By Paul Wooton

Washington Correspondent for the Electrical World

CARRYING the amendments alluded to in the Electrical World last week and appropriating $165,000,000 for construction instead of the original $125,000,000, $25,000,000 of the appropriation being allocated to flood control, the Swing-Johnson bill to build a government dam in Boulder Canyon for flood-control, irrigation and power-generating purposes passed the United States Senate on Friday, Dec. 14, by a vote of 64 to 11. Thirty-one Republicans, 32 Democrats and a Farmer-Labor member voted for it. Four Democrats, including the two Arizona Senators, and seven Republicans voted against it.

The Senate rejected by 53 to 24 an amendment by Senator Reed of Pennsylvania expressing the sentiment of Congress that the government should not construct the proposed power plant except as a last resort after failing to lease power rights to states, municipalities or private interests. For fear of a presidential veto Senator Borah withdrew his amendment to make it mandatory upon the government to construct the power plant. Senator Johnson obtained adoption of an amendment providing that nothing in the act should be "construed as a denial or recognition of any rights, if any, in Mexico to the use of the waters of the Colorado River system."

On the following Tuesday, Dec. 18, the House of Representatives, by a vote of 166 to 122, concurred in the Senate amendments, 79 Republicans and 85 Democrats and two independents voting "ay" and 79 Republicans and 43 Democrats (including Arizona's only Representative, Douglas) voting "no." The effect of this action was to send the measure to the President for signature without having to refer it to a conference committee of the two houses.

At the White House it was stated that the President will handle the bill in the usual way by referring it to the Interior Department for report and to the Bureau of the Budget for an expression of opinion as to the authorization of $165,000,000 involved. It was also said there that the Interior Department had recommended a number of changes in the bill that passed the Senate, but as there will be no conference there is no way of incorporating these changes in the measure unless the President should veto it and return it to Congress for the changes specified. No information was forthcoming as to the exact character of the changes desired, but it is understood that they are not imperative and that the bill is operative in its present form.

Dr. Elwood Mead, the Commissioner of Reclamation, expresses regret that no provision was made for preliminary surveys which could have been carried forward during the period allowed for ratification. He sees in the legislation, however, a constructive achievement which will unlock the great treasure house of resources in the Lower Colorado River Basin. The availability of cheap power will have a very important bearing on the development of the mining industry in Nevada and Arizona, he expects. Dr. Mead, who is the head of the American section of the International Water Commission, believes that the way is now paved for an early agreement with Mexico as to the use of the waters of the Colorado and of the Rio Grande.

Ballard Hints at Co-operation in Southern California

That the passage of the Swing-Johnson bill will give a tremendous impetus to business throughout the Southwest is the opinion of President R. H. Ballard of the Southern California Edison Company as expressed in a Los Angeles interview on Dec. 14. With reference to the power clauses in the bill Mr. Ballard said that he felt sure the situation would be worked out satisfactorily, adding: "In view of the President's declaration and the amended wording of the bill, it seems probable that the Southern California Edison Company, the city of Los Angeles and other present power-producing agencies in southern California will build the power plant under a co-operative agreement."

More Investigation of Utility Publicity in January

Unless court engagements interfere, the Federal Trade Commission expects to resume public hearings concerning the publicity phase of its investigation of electric and gas utilities early in January. This is announced in the ninth interim report of the investigation, just transmitted to the Senate, which also states that, notwithstanding the commission's legal proceedings against the Electric Bond & Share Company, investigators for the commission are still busy in its offices and that, in addition, between fifteen and twenty accountants are now working in offices of large holding companies, in order to obtain data supplementary to the information called for in the general report forms sent out by the commission.

Buffalo's New Unit

Tablet to C. R. Huntley Unveiled as 75,000-Kw. Single-Cylinder Turbo-Generator Begins Operation at Station Named for Him.

AN EVENT of interest to the inhabitants of western New York took place on Dec. 15, when a memorial tablet to Charles R. Huntley was unveiled and the great new single-cylinder steam turbine was placed in service in the Huntley station of the Buffalo General Electric Company. The significance of the event hinged on the circumstance that because of treaty limitations no more water power is available for power purposes at Niagara Falls, so that coal must be burned in the Huntley power house at Buffalo to supply the increasing electrical needs of the community.

If the recommendations of army engineers are followed at Niagara Falls and the treaty is revised, twice as much power can be generated at Niagara without detracting from the beauty of that natural wonder. Meanwhile a 300,000-hp. steam station is in operation at Buffalo, and plans are being considered for another steam station of equal size.

The speakers at the unveiling ceremonies were Daniel J. Kenefick of Buffalo, Edward Dean Adams of New York and William R. Huntley. Paul A. Schoellkopf, president of the Niagara Falls Power Company, placed the 75,000 kw. turbo-generator in operation.

Judge Kenefick, a lifelong friend of the late Mr. Huntley, paid a growing tribute to him as a sturdy citizen and a power in the electric public utility industry. Mr. Adams, who built the pioneer Niagara station, told of the transmission of power to Buffalo in the early days and of Charles R. Huntley's part in organizing and managing the company which distributed the transmitted power in that city. William R. Huntley, a son of Charles R. Huntley and his successor in the presidency of the Buffalo General Electric Company, described the growth of the company and the characteristics of the new unit.

Submetering Evidence Before Commissions

In Manhattan Borough, New York, 2,015 Buildings Give Profit to Meter-Service Concerns and Landlords—Cases Up Also in New Jersey and Washington

LANDLORDS of 2,015 buildings in Manhattan Borough receive 40 to 50 per cent of the profits gained through the practice of the submetering companies which buy electrical energy at wholesale and sell to tenants of apartment houses at retail, according to testimony presented at a hearing of the Public Service Commission of New York on Dec. 14. This practice has diverted about $16,000,000 a year from the utility company's revenue and thereby reduced the opportunities to decrease rates or improve service, Judge William L. Ransom, chief counsel for the Greater New York electric power utilities, declared.

This hearing was the third of a series instituted by the commission to ascertain whether the utility companies shall be permitted to refuse to supply service where it is to be submetered. Suit has been brought in the names of house owners against one of the Greater New York companies for its refusal to sell power that is to be submetered, but testimony revealed that these house owners had delegated power of attorney to the submetering companies in blanket fashion for other purposes.

One of the principal witnesses at last week's hearing was R. P. Grove, assistant to the vice-president and general manager of the United Electric Light & Power Company. In his testimony he presented an elaborate analysis of the submetering situation in Greater New York, bringing out the point that 1,434 complaints were submitted against submetering companies between Jan. 1, 1920, and Nov. 10, 1928, of which 1,315 were from Manhattan, and that 420 have been made in 1928. These were received despite the fact that the commission has repeatedly declared that it has no jurisdiction over submetering companies because they are not yet classed as utilities.

Several witnesses in whose names the suit was instituted asserted that they had never objected to service direct from a utility. One said he preferred it to submetered service, because the submetering companies have no readily available service organization and service restoration and adjustments are difficult to make.

Virtually every owner who is subscribing to submetered service indicated that his primary interest is in the chance to share profits with the submetering company. Testimony showed the percentage received to vary from 40 to 50 and be always a "trade." One owner of several buildings declared that he never considered this profit as a basis for reducing rents. Furthermore, numerous building owners admitted that it is no more expensive to wire an apartment for direct utility service than for submetered service.

Domestic customers have no protection as to rates, service, accuracy of meters or billing, according to the testimony and evidence presented. Two landlords admitted stipulating in their leases that the tenants must purchase power from the submetering company which has the resale privilege in the house. While two owners declared that their contracts with submetering companies stipulated that the retail rates must not exceed the local utility rates, they admitted that no attempts had been made to check the fulfillment of this stipulation.

As indicative of what the domestic customer faces when he purchases power from some submetering firms, the evidence presented in one case is interesting. The customer's bills indicated that he was paying a "coal charge" when none existed in the local utility's rates. They also showed that he was paying a flat rate for power regardless of consumption, although the bill indicated a step rate.

Landlords' Big Profit

Further testimony presented before the commission on Wednesday, Dec. 19, substantiated that at previous hearings and in addition brought out some new points. For example, one extensive owner of real estate testified that one of his buildings in Manhattan receives alone a net income from submetering of $7,000 to $8,000 a year. Furthermore, he reported receiving as high as 75 per cent of the profits of the submetering company, this percentage being determined by how severe the competition for business of submetering companies is. He reported paying 2 cents a kilowatt-hour for electricity. Just because income is or is not received from submetering is no reason for reducing or increasing rentals, he declared, since rentals are based purely on competition and return on investment.

The secretary and treasurer of a submetering company admitted that his contracts with owners prohibited their submetering because he wanted the entire profit. Some of his company's bills were submitted which showed that coal charge of 0.2 cent per kilowatt-hour was actually calculated as 2 per cent of the total bill. Although admitting that he knew the commission had no control over submetering companies, this witness also testified that he referred his complaining clients to the commission. This practice was labeled by Chairman Prendergast as deliberately misleading to the public.

Three tenant witnesses objected strenuously to being compelled to buy power through submetering companies, one saying that he must pay ½ cent more per kilowatt-hour than the utility company charges. He also objected to submetering on the ground that it diverts from investors in utility securities a rightful return. Another tenant witness declared that he could not have a test made on a submeter suspected of inaccuracy without paying $3 in case the meter were correct. When fuses burned out he could not get service from the submeter company but did from the New York Edison Company, although it was not obligated to render it.

C. L. Harold, sales manager Brooklyn Edison Company, submitted a report showing that, as a check test on the availability of emergency service from submetering companies, he called several submeter companies on the telephone one evening and in several cases received no response. Out of nine submetering companies doing business in Brooklyn, he testified that only two had offices there.

In Other States

The same question came up last week before the New Jersey Board of Public Utility Commissioners, which sustained the Public Service Electric & Gas Company in refusing to install a master meter for an apartment-house owner in East Orange who was to share the profits with a meter-service company employed to furnish the submeters. A summary of this decision is given under "Commission Rulings" on page 1269.

At Washington arguments are going on before the Public Utilities Commission of the District of Columbia on the question of ordering a discontinuance of the whole practice of submetering. Officers of the Potomac Electric Power Company were heard. People's Counsel Ralph B. Fleharty supported the position of S. R. Bowen, vice-president of the company, against investigating past practice. Mr. Fleharty held that landlords who had bought power at wholesale rates and resold it to their tenants at retail rates were a privileged class and were receiving a benefit which should be distributed among all the users of electricity in the District. J. J. Moebs, owner of the Dupont Building, testified that he charged his tenants only power-company rates and made no profit.

Lackawanna Denies Inviting Bids for Electrification

Although newspaper accounts report that the Delaware, Lackawanna & Western Railroad is inviting bids for its electrification project, that the initial outlay will be from $10,000,000 to $12,000,000, and that the company will build its own power station if satisfactory arrangements are not made with the Public Service Corporation of New Jersey, both the Lackawanna Railroad and its consulting engineers, Jackson & Moreland, deny these statements. No formal bids have been solicited and no contracts made, nor has a decision been reached regarding whether to use purchased or railroad-generated energy. Cost figures for either plan have not yet been formulated. No information other than that reported in the Electrical World for Nov. 17 (page 1009) is available.

West's Confirmation Opposed as "Insull Man"

Opposition to the confirmation of Roy O. West as Secretary of the Interior in succession to Hubert Work was overcome so far as the public lands committee of the Senate is concerned when that committee on Wednesday voted by seven to three to recommend to the Senate that he be confirmed. The reasons given for disapproval of the nomination are interesting to the electrical industry since they concern Mr. West's former status as one of the counsel for the Insull companies and as a stockholder in them. It was shown that Mr. West had disposed of his stock but that members of his family still owned some. The fact that the Secretary of the Interior is a member of the Federal Power Commission and that the Insull companies have applications pending before that body for valuable water-power sites was the main basis for the opposition. Mr. West declared his willingness to refrain from taking part in any action by the commission on these sites. Senators Walsh of Montana, Nye and Wagner voted against indorsing him.

Trade Commission Dismisses Radio Monopoly Charge

Dismissal of its complaint against the General Electric Company, the Radio Corporation of America, the Westinghouse Electric & Manufacturing Company, the American Telephone & Telegraph Company, the Western Electric Company and others, charging unfair competition in monopolizing the manufacture and sale of radio devices and monopolizing radio communication, was announced on Wednesday by the Federal Trade Commission "because of lack of sufficient proof and because the subject matter of the charges was not in the commission's jurisdiction."

House Heating by Electricity at Fort Wayne, Ind.

An experiment of great interest is being made at Fort Wayne, Ind., where apparatus has been installed in sixteen residences designed to heat them electrically with equipment invented by Chester I. Hall of the General Electric Company, manufactured by that company and installed by the Hall Electric Heating Company in houses insulated, as is the equipment itself, by rock wool and asbestos supplied by the Johns-Manville Corporation. The underlying principle is storage of electricity in the form of hot water, and the system is asserted to be adaptable to hot-air, hot-water and vacuum forms of house heating, its operation being entirely electrical and automatic.

Power is supplied by the Indiana Service Corporation. Contracts have been worked out for house heating and hot water on a yearly basis which is equivalent to 1 cent a kilowatt-hour. The house-heating season runs from Oct. 15 to May 15, guaranteeing 60 deg. F. for eight hours and 70 deg. for sixteen hours a day in zero temperature. The hot-water contract covers the entire year. The electric control of the heating system is fixed so that use of electricity is during the period of smallest demand on the power station—10 p.m. to 6 a.m. The cost of heating a house containing seven rooms and bath and supplying hot water is $210 a year.

Tenth Unit Soon to Go in at Queenston Power House

The Queenston power house of the Ontario Hydro-Electric Power Commission is to be completed after seven years of operation. The commission has plans under consideration for the completion of a tenth unit of 65,000 hp. rating. This added to the present plant will bring the total installation up to 625,000 hp.

The cost of the additional unit will be about $4,000,000. While no additional work will be required on the canal itself, it will probably be necessary to enlarge the forebay on the north side and put in an additional penstock. When the right-of-way for the Chippawa-Queenston Canal was acquired, sufficient land was taken to permit the construction of a duplicate canal should international agreement sanction the addition. It is believed that the idea of enlargement has been abandoned by the engineers of the Hydro-Electric Power Commission, and if at any time a duplicate canal be built, it will be a short distance away from the one now in operation.

Hell Gate Station's Big New Units

Description of the Brown Boveri and the Westinghouse 160,000-Kw. Turbo-Alternators, Which Will Bring the Capacity of the Power House to 605,000 Kw.

RAPID progress on the installation of the two 160,000-kw. generating units—one a Westinghouse and one a Brown Boveri machine—that are being set up simultaneously at the United Electric Light & Power Company's Hell Gate station, at East 132d Street and the waterfront, New York, makes the following account of their structure and differences, furnished by the company's engineering staff at the request of the ELECTRICAL WORLD, of timely interest. When they go into operation they will increase the rating of the plant from 285,000 kw. to 605,000 kw., making it, for the time being at least, the company asserts, the largest steam generating plant in the world.

The first unit, known as unit No. 8, was manufactured by the American Brown Boveri Electric Corporation and is virtually ready for commercial operation. The second unit, known as unit No. 9, will be completed within the next few weeks. The station was originally designed for only 280,000 kw. capacity, and unit No. 8 is installed in the space originally intended for a 35,000-kw. machine. In order to install unit No. 9 it was necessary to extend the turbine room 70 ft.

The American Brown Boveri turbo-alternator comprises a high-pressure single-flow turbine and a low-pressure divided-flow turbine. The unit occupies the space of 38 ft. x 70 ft. The high-pressure rotor is direct-connected to a 75,000-kw. (88,250 kva.), 60-cycle, three-phase, 13,800-volt, 1,800-r.p.m. generator. The low-pressure turbine is direct-connected to an 85,000-kw. (100,000 kva.), 60-cycle, three-phase, 13,800-volt, 1,200-r.p.m. generator. Each generator has its own direct-connected exciter.

The governing of this machine is of so-called by-pass type. At 90,000 kw., which is the best point, the secondary valve begins to open and admits steam to one of the lower stages of the high-pressure turbine. At 130,000 kw. the tertiary valve admits steam to a still lower point in the high-pressure turbine. On account of the enormous quantity of steam involved it was found desirable to use two valves in parallel in each case. Each generator has its own direct-connected fan exterior to the generator housing, which supplies air to the generator by means of an external duct—the radial cooling system being employed. The fans provide a total of 260,000 cu.ft. per minute. Air coolers are installed under the generators in the duct communicating with the fan.

The high-pressure rotor of the Westinghouse 160,000-kw. turbo-alternator is direct-connected to an 80,000-kw. (94,200-kva.), 60-cycle, three-phase, 13,800-volt, 1,800-r.p.m. generator. This generator in turn is tied to two exciters which supply both high-pressure and low-pressure main generators. The low-pressure rotor of the unit is direct-connected to an 80,000-kw. generator, which is identical with that of the high-pressure unit. In addition to the main generators, this rotor also has a 5,000-kw. (6,250-kva.), 60-cycle, three-phase, 2,300-volt generator which supplies auxiliary power. The auxiliary generator has its own exciter directly connected to it.

The cooling air for the generator is supplied by three motor-driven propeller-type fans each having a capacity of 91,667 cu.ft. per minute. The governing mechanism is very similar to that of the American Brown Boveri unit, except that the primary valve is wide open at 86,000 kw. load on the unit; the secondary is wide open at 126,000 kw.

Both machines are designed to operate at 265 lb. pressure gage at the

turbine throttle 725 deg. total temperature and 729 deg. exhaust vacuum. Both units have stainless-steel tapered blading and each machine is of the so-called reaction type.

Both units are provided with bleed points, two of which will be used at present to supply steam to the closed heaters. Each unit has a 137,500-sq.ft. double two-pass condenser, each consisting of two two-pass condensers having a common inlet and discharge water boxes. The cooling water is supplied by two circulating pumps, each having a capacity of 77,500 gal. per minute.

The main difference between the two machines is that the rotative speed of the low-pressure element of the American Brown Boveri unit is only 1,200 r.p.m., as compared with 1,800 r.p.m. for the Westinghouse machine. The Westinghouse unit in addition to the two 80,000-kw. main generators also has a 5,000-kw. auxiliary unit. In the American Brown Boveri machine the capacity of the low-pressure generator is 10,000 kw. more than that of the high-pressure element, whereas the generators for the high- and low-pressure elements of the Westinghouse unit are identical. The cooling air for the American Brown Boveri machine is supplied by direct-connected fans in special housings, whereas the fans for the Westinghouse unit are vertical and motor-driven. The Westinghouse machine is somewhat lighter than the American Brown Boveri, the former weighing 673 tons, as compared with 730 tons for the American Brown Boveri.

These two units, together with their equipment of condensers, piping, cables, switches and auxiliaries, represent an investment of approximately $6,000,000.

Toledo Edison Will Spend $3,000,000 for Expansion

The Toledo Edison Company plans to spend $3,000,000 in Toledo and vicinity for its 1929 expansion program, C. L. Proctor, vice-president and general manager, has just announced. The biggest item, which will involve expenditure of $1,500,000, will be a new turbo-generator to be installed at the Acme power plant. This unit will be delivered about Jan. 15, will be ready for use on or before April 1, and will increase the capacity of the Acme plant to more than 110,000 kw. This plant serves the business and industrial section, an area that continually is demanding more power.

Several substations within the city, additional underground work in the downtown district and extension of lines to serve additional customers in and about Toledo—all purely local expansion—will require the balance of the $3,000,000. The Toledo Edison Company now supplies about 90 per cent of the city's industry with its power. In 1928 several power consumption records have been broken and at times the plant has been taxed to meet the demand.

Employees of the company, in the most successful customer-ownership stock campaign ever conducted by it, recently sold 9,794 shares, the sales totaling nearly $1,000,000.

Purchases and Mergers

Barberton (Ohio) Municipal System Taken Over by Northern Ohio Power & Light for a Cash Consideration of $825,000

PURCHASE of the municipal electric system of Barberton, Ohio, by the Northern Ohio Power & Light Company of Akron for $825,000 cash is announced. This sale follows six months' amicable negotiation and is accompanied by a 25-year franchise. Though the municipal plant had been in operation for fifteen years, the city had for eight years bought energy from the company, which also supplied contiguous districts, and owing to territorial annexations by Barberton, the two distribution systems duplicated each other in certain sections.

The Buffalo, Niagara & Eastern Power Corporation has been authorized by the New York Public Service Commission to acquire and hold all or more than 10 per cent of the outstanding common stock of the Lockport & Newfane Power & Water Supply Company of Middleport, N. Y. The corporation petitioned for authority to acquire 19,475 shares of common stock of the Lockport & Newfane company, without par value, for $1,359,152. The Lockport company has a hydro-electric development on Eighteen-Mile Creek and has surplus power which can be operated to advantage in connection with the Niagara, Lockport & Ontario Power Company, a subsidiary of the Buffalo, Niagara & Eastern.

The physical property of the Citizens' Light & Power Company of Oil City, Pa., and the Titusville (Pa.) Light & Power Company have been taken over by the Keystone Public Service Company of Pennsylvania. These companies are part of the National Electric Power group.

The W. N. Albertson Company announces the purchase in the last two months of control of 41 utility properties in North and South Dakota, North Carolina and Wisconsin. These consist of electric light plants, telephone exchanges and ice and gas companies in smaller units, grouped together for economies in management. The company has opened branch offices in Milwaukee, Chicago and Jefferson City, but its operating headquarters remain in Omaha.

A hearing in the matter of the petition of the city of Mauston, Wis., to acquire the electric distribution system owned by the Wisconsin Power & Light Company has been set for Jan. 3 by the Wisconsin Railroad Commission.

The Nebraska Electric Power Company has purchased for the sum of one dollar the municipal plant at Atlanta, Neb.

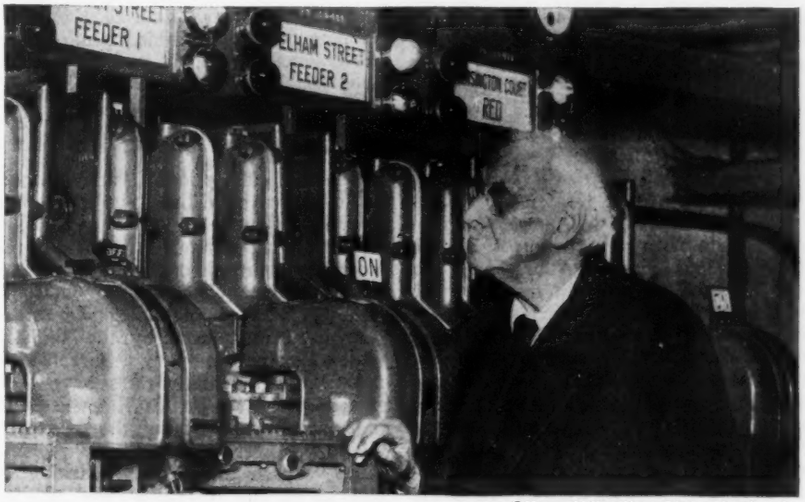
By a margin of 505 out of a total of 543 votes, the town of Lawrenceburg, Tenn., has voted not to sell the two hydro-electric plants now owned and operated by the municipality. The election was called after the Southern Cities Power Company had made an offer of $476,000 for the two plants and a 30-year franchise.

The Mutual Light & Water Company, Brunswick, Ga., a subsidiary of the Southeastern Power & Light Company, has purchased the plant and distribution system of the Sea Island Utilities on St. Simon's Island and will take them over Jan. 1.

The South Carolina Gas & Electric Company, with headquarters in Spartanburg, S. C., serving many textile plants and other industries, was bought at foreclosure sale by the Southern Public Utilities Company of Charlotte on Dec. 10 for $4,200,000. E. C. Marshall, president of the South Carolina Gas & Electric Company, is also president of the Southern Public Utilities Company, which owned 95 per cent of the common stock of the former company. The two concerns are affiliated with the Duke Power Company.

Shareholders of the Laurentide Power Company at Montreal have decided to accept the offer of the Shawinigan Water & Power Company, noted last week, to purchase its assets.

England's Grand Old Man of the Inventive World



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COL. R. E. CROMPTON, known as the "grand old man of the English inventive world," is a pioneer in modern electricity in England to whom the Britons declare they owe much of their present electric progress. The Colonel is 83 years old and is a veteran of the Crimean War.

Tablet Marks Edison's Old Schenectady Shops

Another radio speech was made by Thomas A. Edison on Saturday, Dec. 15, when from his New Jersey laboratory he dedicated a tablet unveiled at Schenectady, N. Y., to commemorate two old shops first occupied by the inventor when, 42 years ago, he moved his machine works to that city, where in a sense they formed the nucleus of the General Electric Company's present plant with its 350 buildings.

Introduced by Edwin W. Rice, Jr., honorary chairman of the board of directors of General Electric, Mr. Edison said: "If it were not for the unveiling of this tablet today, I should scarcely have realized that it was forty-two years ago since I took the momentous step of moving the Edison machine works to Schenectady. At that time the removal to such a distance was in the nature of a high adventure. The electric light and power business was moving onward and upward by leaps and bounds. We were long on orders, but short on money. But we managed to get money and continued to grow amazingly."

William H. Meadowcraft, speaking at the exercises in Schenectady, told about the inventor's present occupations, and a reminiscent letter was read from Samuel Insull, the first executive of the original plant, and also one from N. I. Schermerhorn, president of the Citizens' Trust Company of Schenectady.

The tablet was unveiled by Vice-President George F. Morrison of the General Electric Company, himself an Edison pioneer.

Nebraska Tri-County Plan Merged in Larger One

Virtual abandonment of the original Tri-County organization in central Nebraska, which sought two years ago to secure a loan of the state's credit to finance a thirty-million-dollar combination power and irrigation plan, with two power plants on the Platte River, was announced at a meeting of the principal promoters held at Hastings on Dec. 5. It is to be merged into a much larger and more ambitious plan, the details of which will not be agreed upon until after the corps of army engineers now at work have made their recommendations with respect to what public works on the Platte River will be necessary in connection with flood control of the Missouri and Mississippi Rivers. They are expected to make in the next few weeks a preliminary report which will recommend an extensive storage-reservoir system, doubling the capacity of the dams in Wyoming which feed the western Nebraska irrigated section and providing other storage facilities for irrigation purposes.

Prof. Clark E. Mickey of the University of Nebraska, who has been the advisory engineer for the Tri-County association, says that the eventual plans will include scores of small reservoirs, placed not only along the Platte River, but at the mouths of its tributaries, with as many feasible power-plant projects. The distance from the principal markets for electrical energy was the weightiest objection urged against the old plans, but Mr. Mickey says the plants included in the new proposal will be able to supply local town and farm demands profitably. The proposal also includes insuring a sufficient supply of water to irrigate two million acres and to augment the water supply of Lincoln and other municipalities.

N.E.L.A. Publishes Report of Oil-Heating Investigation

About eight months ago the National Electric Light Association undertook a survey of the oil-heating field. It was recognized that the size of this industry and the number of burners on the market and already installed embodying the principle of automatic oil heating, electrically controlled, warranted the same sort of investigation that the association conducted a few years ago on electric refrigerators. The results of this survey, which has just been completed, have been printed by the association for the information of the electric light and power companies, the oil and oil heating companies and the general public. The investigation included studies of 700 oil-burner installations in seventeen key cities in various parts of the country with the view of determining the practical qualities of the burners that are now on the market. Co-operating with the N.E.L.A. in this work were the American Petroleum Institute, American Oil Burner Association, Oil Heating Institute, American Society of Mechanical Engineers, Underwriters' Laboratories, National Fire Protection Association and a number of individual manufacturers and power companies.

The report discusses in detail the types of burners and analyzes the merchandising methods of the manufacturers. While no definite recommendations are made to the member power companies, the possibilities these developments offer in added comfort and convenience in homes and public and commercial buildings are made clear.

Rate Reductions in Indiana

Notice that optional "active-room" electric rates have been put into effect in six more cities served by companies of the Central Indiana Power Company group has been filed with the Indiana Public Service Commission. Optional domestic and commercial power rates have been introduced by the Wabash Valley Electric Company at Greencastle and Clinton. Similar rates have been introduced by the Attica Electric Company at Attica and by the Northern Indiana Power Company at Noblesville, Wabash and North Manchester. The rates in all cases are similar to rates recently introduced by the Northern Indiana Power Company at Rochester, Ind.

The active-room rate schedule first was introduced in Indiana two years ago at Martinsville, and soon afterward at Huntington, both companies being served by Insull-operated utilities. The introduction brought about an investigation by the Indiana commission and an expression of disapproval by it of the theory. The investigations never have been closed by the commission, and at present the optional rates continue in the two cities named.

Power rate reductions which will mean a cut of as much as 30 per cent to large consumers in South Bend and Elkhart, Ind., have been approved by the Public Service Commission in an order governing rates of the Indiana & Michigan Electric Company. Commissioner Calvin McIntosh stated that the company will also set a schedule putting rural consumers on the same rate basis as those in the cities. This change will affect Indiana and Michigan farmers.

Permits Desired for Eel River and Six Small Projects

Frederick C. Rockwell of Carmel, Calif., has applied to the Federal Power Commission for a preliminary permit covering a project on the North Fork of Eel River in Trinity County, Calif. He proposes to construct a dam 300 ft. high and 665 ft. long, creating a reservoir with a capacity of 137,000 acre-feet. Primary power to the extent of 16,000 hp. will be made available, the applicant estimates.

The Fargo Engineering Company of Jackson, Mich., has applied for a preliminary permit covering a 2,000-hp. project on the Kalamazoo River in Allegan County, Mich. A previous application by this company covered the entire head available between the dam site and the city of Allegan. This was rejected in favor of the municipal project, which utilizes half of the available head. The present application covers the remaining power resources in the stream.

The People's West Coast Hydro-Electric Corporation of Portland, Ore., has applied for a preliminary permit covering a development on Strawberry and Onion Creeks in Grant County, Ore. It is planned to install 1,000 kw. The company also applied for a license covering an existing 180-hp. project on Rush Creek, near Cambridge, Idaho. The property recently was purchased from the Adams County Light & Power Company, which has been operating since 1914, under a Department of Agriculture permit.

A. L. Shreve of Mapleton, Ore., has applied for a license covering a 40-hp. project on Berkshire Creek in Lane County, Ore. The power is to be used for domestic purposes in the town of Mapleton. The Nevada Valleys Power Company of Lovelock, Nev., has applied for a license covering a transmission line 7 miles long, connecting the company's plant with a nearby mining camp. The La Plata Mines Company of La Plata, Colo., has applied for a license covering a transmission line 10

miles long. The power is to be used at the mines of the company. The Marian Mining Company of Denver, Colo., has applied for a preliminary permit covering a 240-hp. project on the Alamosa River in Rio Grande County, Colo. The power is for use in neighboring mining properties.

Progress of Salt River Valley's 600-Mile Network

The Salt River Valley Water Users' Association is rushing work on the million-dollar electrical project of that valley, which will place electric power in the homes of more than five hundred Arizona ranchers. Construction will be carried out in sections, completing the wiring of the entire valley at the same time. The association is, as before reported, erecting 8,000 steel poles to carry the power lines. With the aid of mechanical holediggers, these are being installed at the rate of 60 a day.

The association will construct nine electric substations, costing approximately $150,000, for distribution of the power. Power reaching the substations will be reduced to a voltage of 3,000 or 4,000. Each of the nine power transformers will be controlled by an automatic reclosing circuit breaker, and each station will have two power supply lines. Approximately 600 miles of new power line will be erected.

Midwest Power Conference Arranges Program

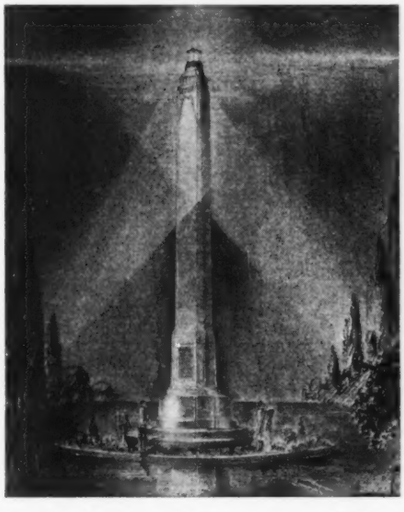
Six general sessions, three luncheon meetings and a banquet and dance will make up the program of the fourth Midwest Power Conference, to be held in Chicago from Feb. 12 to Feb. 15. All meetings and sessions will be at the Palmer House, where a total of twenty papers will be presented.

On Tuesday the conference will begin with a "get-together" luncheon. Wednesday morning will be devoted to metallurgical and chemical problems, with three papers by authorities in this field. The afternoon session, controlled by members of the American Institute of Electrical Engineers, will cover electrical engineering subjects. On Wednesday evening the banquet and dance will immediately follow a notable address. On Thursday morning problems in heating, ventilating and refrigeration will be covered, and in the afternoon three papers under the general classification of power-plant operation will be given. The Friday morning session will be devoted to power-plant economics, with three papers by members of the American Society of Mechanical Engineers. The conference will close at noon on that day, giving engineers an opportunity of visiting the Power Exposition, which will be held during the same week in Chicago. Visiting engineers may avail themselves of the opportunity to visit any one of a list of fifty or more modern industrial and utility plants in the Chicago area which will be open for their inspection.

Briefer News

ALBANY, N. Y., TO CHANGE TO 60 CYCLES.—Albany, N. Y., one of the few American cities with more than 100,000 people that remain on 40-cycle frequency, is to be changed over to 60 cycles within a year, according to the New York Power & Light Corporation, which serves that city. More than 35,000 homes and places of business and more than 100,000 machines and appliances will be affected. The company expects to complete half the work, for which it has made extensive preparations, by May next.

JORDAN DAM BEACON AND MONUMENT.—The aëronautical beacon that tops the commemorative monument at the Alabama Power Company's recently completed Jordan Dam was put into service on Dec. 10. It will be operated by the company under a permit from



the United States Department of Commerce, and under favorable conditions its rays will be visible for a radius of 45 to 50 miles, which will include Montgomery. Two 1,500-watt lamps in the beacon are lighted by power from the dam. They will be operated from sunset to sunrise. The 50-ft. granite monument carries at its base a bronze tablet bearing an appropriate inscription.

TEXAS DAM-BUILDING PERMITS ARE GRANTED TO THREE COMPANIES.—A permit has been granted by the Texas Board of Water Engineers to the Central Power & Light Company to construct a dam on Devil's River and to divert 300 sec.-ft. of water from that stream for hydro-electric purposes. The reservoir formed by the dam will have a capacity of 47,700 acre-feet of water. The company is constructing a series of dams and hydro-electric plants on Devil's River and will transmit power from them to towns and industries in southwest Texas. The board has also granted a permit to the West Texas Utilities Company of Abilene to build a dam on Lytle Creek and to divert 2,500 acre-feet of water annually for water supply and industrial purposes. To the Phillips Petroleum Company of Bartlesville, Okla., permit was granted to erect a dam on Big Creek, in the Hutchinson County oil field, and to divert 1,884 acre-feet of water annually.

ECONOMICS ASSOCIATION TO HEAR ELECTRICAL PAPER.—Dr. W. H. Peck, professor of economics at Syracuse University, will read a paper entitled "An Inductive Study of Publicly Owned and Operated Versus Privately Owned but Publicly Operated Utilities" before the American Economics Association at Chicago in the last week of December. This will be a comparison of the Ontario system and the conditions in New York State from the economic and engineering point of view.

TACOMA'S PLANS FOR ENLARGING MUNICIPAL HYDRO PLANT.—The city of Tacoma, Wash., will increase the output of the Cushman hydro-electric power project by approximately 30,000 hp., and bids on the contracts involved, including construction of a power house at Potlatch, are to be called within the next few weeks, according to J. L. Stannard, construction engineer. The work will cost approximately $2,000,000. The dam will be 70 ft. wide at the bottom, about 540 ft. wide at the top and 240 ft. high.

ASSOCIATION SECRETARIES MEET.—Sixty-five secretaries of public utility associations in the United States and Canada attended the meeting of the Utilities Association Secretaries of the United States held in New York City on Dec. 3, 4 and 5. O. A. Weller of Denver was elected chairman and Harold Buch of Harrisburg, Pa., secretary. The meeting next year will be held in Chicago during the first week of December. Among those who addressed the meeting were George B. Cortelyou, J. F. Owens, Paul S. Clapp and J. B. Wootan.

FEDERAL GOVERNMENT WILL NOT DISREGARD CALIFORNIA LAW AGAINST DAMS ON THE KLAMATH.—Dispatches from California say that in a letter sent to the state Department of Natural Resources from the Department of the Interior at Washington it is promised that the federal authorities will not sanction the building of power dams on the Klamath River in the Hoopa Indian reservation. An initiated law in California forbids the construction of dams on the Klamath, in the interest of fish preservation, but the state is without jurisdiction over the reservation.

CENTRAL MAINE POWER'S COMING KENNEBEC RIVER PLANT.—Preliminary work has been started by engineers of the Central Maine Power Company on its projected hydro-electric development of the Kennebec River, near

Bingham, Me. Actual work on construction of a 100-ft. dam will begin in the near future, though it is not expected that the new dam will begin to fill with water before the spring of 1931. The head of water at this location will be sufficient to generate approximately 60,000 hp. It will anticipate by several years the growth of the adjoining territory.

DEVELOPMENT OF GUADALUPE RIVER TO BEGIN.—Construction of five dams and hydro-electric plants upon the Guadalupe River at points between Seguin and Gonzales, Tex., will be started immediately by the Hunt Development Company, to which permits for the diversion of 941,000 acre-feet of water for this purpose have just been granted by the State Board of Water Engineers. It is reported that the company will expend approximately $5,000,000 in the construction of the dams, plants, transmission lines and other work connected with the project. The proposed plants will generate approximately 16,000 hp.

UTILITY CONFERENCE AT BARTLESVILLE, OKLA.—For the Eastern District conference of the Electric Light and Power Division, Oklahoma Utilities Association, held at Bartlesville Dec. 17, the addresses scheduled included among their authors W. H. Crutcher of Muskogee, R. K. Lane of Tulsa, W. L. Crittenden of Oklahoma City, Fred W. Insull of Tulsa, R. E. Hayman of Oklahoma City, S. E. Wolff of Sand Springs, E. F. McKay, manager of the association, and Miss Juanita Bratten of the women's committee, N.E.L.A. Electric light and power utility executives and employees from all sections of eastern Oklahoma attended the conference.

PENNSYLVANIA-OHIO POWER & LIGHT ERECTING 20,000-KVA. SUBSTATION AT YOUNGSTOWN.—An outdoor-indoor substation with a transformer rating of 20,000 kva. is approaching completion on North Avenue, Youngstown, for the Pennsylvania-Ohio Power & Light Company, at a cost of $600,000. The outdoor part of the station is on the roof of the inclosed portion. The building is 96 ft. long by 42 ft. deep and 42 ft. high, the outdoor section rising another 45 ft. It contains six bays and will serve twelve distribution circuits. Stevens & Wood, the engineer-builders, performed the feat of forcing 204 ft. of 4-ft. pipe under twelve railroad tracks at a depth of 21 ft. without excavating either a tunnel or a ditch.

ONTARIO HYDRO TO SLASH RATES IN EASTERN PART OF PROVINCE?—According to a news dispatch from Kingston, Ontario, the Hydro-Electric Power Commission will in the near future deliver power in eastern Ontario municipalities at $14.70 per horsepower. This means a reduction in rates in many places of from $9 to $12. The dispatch says that consumers of electricity in Carleton Place, which will receive power generated at the plants of the Gatineau Power Company, will pay $38 to $41 per horsepower, instead of the present rate of $50, this being a reduction of approximately 25 per cent outside of service charges, which are already fixed.

INDUSTRIAL SURVEY IN VERMONT.—President Frank D. Comerford of the New England Power Association has announced that an industrial survey of Vermont will be immediately undertaken by this organization under the direction of Hugo Rocktashel, sales manager, the field work being in charge of Willard F. Cowhig, industrial engineer, of Boston. Headquarters will be established at the offices of the Fall Mountain Electric Company, Bellows Falls. Upon completion of the survey commercial agents of the association will go into various metropolitan areas in the endeavor to secure new industrial enterprises for the Green Mountain State.

ST. LOUIS STREET-LIGHTING SYSTEM NOT YET COMPLETE.—Contract for an electric street-lighting system in District F of St. Louis has just been awarded at $481,325. This district, which extends from Newstead Avenue to the western city limits between Page Boulevard and Oakland Avenue, will have 2,218 new standards, which combined with those already in service in this section will give it 4,007. They range in size from 150 cp. to 600 cp. A substation for the district will be installed in Sherman Park. These expenditures will exhaust the $8,000,000 voted by the city in February, 1923, for street-lighting purposes. Approximately 60 per of St. Louis has been covered, but a supplemental bond issue of at least $4,000,000 must be voted if the entire city is to be modernized. Many streets in the northwestern and southwestern stretches are still lighted by gas.

Coming Meetings

[A complete directory of electrical associations, with their secretaries, is published in the first issue of every volume. For latest list see issue for July 7, page 48.]

Empire State Gas and Electric Association—Electric Section, United Engineering Societies Bldg., New York, Jan. 10 and 11. C. H. B. Chapin, Grand Central Terminal, New York.

American Engineering Council—Annual meeting, Washington, Jan. 14 and 15. L. W. Wallace, 26 Jackson Place, Washington.

Kentucky Association of Public Utilities—Brown Hotel, Louisville, Jan. 15 and 16. E. F. Kelley, Louisville Railway Co., Louisville.

North Central Electric Association — Engineering Section, Minneapolis, Jan. 21-22; Commercial Section, Minneapolis, Feb. 25 and 26. J. W. Lapham, 803 Plymouth Bldg., Minneapolis.

National Electrical Manufacturers' Association — Supply Division, Hotel Commodore, New York, Jan. 21-26. S. N. Clarkson, 420 Lexington Ave., New York.

American Institute of Electrical Engineers—Winter convention, New York, Jan. 28-Feb. 1; regional meeting, Cincinnati, March 20-22. F. L. Hutchinson, 33 West 39th St., New York.

Midwest Power Conference — Chicago, Feb. 12-16. G. E. Pfisterer, 53 W. Jackson Blvd., Chicago.

New Mexico Utilities Association — Franciscan Hotel, Albuquerque, Feb. 18-20. Bernard L. Wiles, Albuquerque Gas & Electric Company, Albuquerque, N. M.

Oklahoma Utilities Association—Oklahoma City, March 12-14. E. F. McKay, 1020 Petroleum Bldg., Oklahoma City.

OREGON WATER CONSERVERS STILL ACTIVE.—The Governor of Oregon has been petitioned to exercise the influence of his office in behalf of state legislation providing for the conservation of water-power resources. The petitioners represent labor, sportsmen and the commercial fish industry, and the legislative program which the Governor is asked to support involves denial of all applications for permits to appropriate water for hydro-electric power developments where such developments will interfere with the life of game and commercial fish, or will involve transmission of power for use in other states, or where the water has a potential value for irrigation, or where it is deemed necessary to other industries. Governor Patterson will hold a hearing on the petition in Portland in the near future.

SECOND THOUGHTS ON MUNICIPAL OWNERSHIP AT BUHL, IDAHO.—A municipal power plant proposal at Buhl, Idaho, which is served by the Idaho Power Company, was defeated in a recent election. Sentiment for the municipal power plant appeared to be less than it was in 1927, when a bond issue was passed by a substantial majority. The total ultimate cost of the plant was estimated at $165,000, the claim being that it would pay for itself in six years, after which it would bring a substantial income to the city. Failure of the recent measure nullifies the passage of the bond issue, since the bonds have not been sold.

DIXIE POWER COMPANY OF UTAH OUTLINES FUTURE PROGRAM.—Immediate completion of one hydro-electric unit, the probable construction of another and a full program of fifteen years' duration for the Dixie Power Company were disclosed in a public announcement made at Cedar City, Utah, on Dec. 6 by Lafayette Hanchett of Salt Lake, president of the company. The entire program involves an expenditure of $2,000,000. The plant to be pushed to completion is known as No. 4, will have a capacity of 1,100 hp. and is just west of La Verkin on the Virgin River. In case of rapid mining development, early construction of another plant on the Virgin River may become necessary.

PREPARING TO SUPPLY POWER TO NEW EL PASO INDUSTRIES.—An addition to the power plant of the El Paso (Tex.) Electric Company, operated by Stone & Webster, will, it is reported, be constructed at a cost of approximately $4,500,000 if negotiations which are now pending for the supply of electric power to large zinc-mining interests are satisfactorily concluded. It is understood that the electric com-

pany has offered an attractive power rate to officials of the United Mines Company in an effort to have the company build a zinc plant in El Paso. If this plant should be built, the El Paso Electric would have to double its capacity. The latter company may also supply power to the Nichols Copper Company, which will build a copper refinery in El Paso.

PROPOSED LAWS AIMED AT NEBRASKA POWER COMPANIES. — Nebraska power companies are to be under attack at the session of the Legislature beginning January next. Trenmor Cone, floor leader of the House Democrats, has announced a program for legislation which includes requiring companies serving more than one community to charge the same rate in each, granting permission to cities operating lighting plants to supply towns and patrons beyond their limits, prohibiting public utilities from collecting service charges, and supplying the new State House and the state university with energy from the enlarged plant at the state penitentiary instead of having a separate plant.

EEL WEIR (N. Y.) HYDRO PLANT GOES INTO SERVICE.—The first wheel of the Eel Weir power plant on the Oswegatchie River near Ogdensburg, N. Y., was started on Dec. 10, and the entire plant will be in operation by Jan. 1. The plant has been constructed for the St. Lawrence Valley Power Corporation at a cost of $350,000 and will develop 3,300 hp. much of which will be utilized by industries in Ogdensburg. A power line from the plant to that city has been constructed. The power house contains two I. P. Morris propeller-type units and a smaller one manufactured by James Leffel & Company of Springfield, Ohio. The dam is of the Ambursen type, 14 ft. high and 750 ft. long at the crest.

GATINEAU POWER COMPANY TO BUILD ANOTHER STORAGE DAM.—The Gatineau Power Company, whose rapid growth has been chronicled in the ELECTRICAL WORLD, has now begun construction of another storage dam on the Gatineau River in the Province of Quebec. Work will be carried on throughout the winter, and it is expected that the dam will be completed and ready for operation next summer. The new dam —storing the waters of Lake Cabonga— and the present Mercier storage dam will form reservoirs ranking with the large water-storage systems of the world. The two reservoirs will have a combined capacity of 145,000,000,000 cu.ft. Located in the heart of one of the great timberland areas of the Canadian International Paper Company, the Cabonga dam will be 46 miles above the Mercier dam and will form a reservoir of 45,000,000,000 cu.ft., draining a territory of 1,150 square miles. The new reservoir will materially assist the Mercier reservoir in regulating the flow of the Gatineau River on which the Gatineau Power Company has completed three hydro plants in the past two years.

Commission Rulings

NEW JERSEY COMMISSION DISAPPROVES APARTMENT-HOUSE MASTER METERS.—Refusal of the Public Service Electric & Gas Company to install a master meter in an apartment house in East Orange has been sustained by the Board of Public Utility Commissioners of New Jersey. The commission held that it is not the duty of an electric company to install a master meter in an apartment house to register energy to be resold by a meter supply company to tenants, when the electric company is ready and willing to supply service and has facilities to do so. The apartment-house owner contracted with the Meter Service Corporation for the latter to install submeters to serve the various apartments. It was proposed by the owner to buy, in partnership with the meter corporation, electrical energy at a quantity rate from the Public Service company and to retail it to the tenants at the company's retail rate, dividing between the parties to the agreement the difference in the two rates. The commission held that there was involved a question of public policy which relates to the practical application of a well-defined state policy in matters of regulation. It pointed out that there was nothing to show that the tenants preferred that meters should be installed by the Meter Service Corporation and brought out the distinction between apartment houses, where each tenant's consumption of electricity is recorded on an individual meter, and hotels and office buildings, where the charges are an undistinguishable part of the rent.

VALUE OF CHESTER (MASS.) MUNICIPAL PLANT ADJUDICATED.—The Massachusetts Department of Public Utilities, in a report filed in the Supreme Judicial Court, has made the following decision upon a petition of the town of Chester, Mass., against the Chester Electric Light Company: "That the respondent conveyed to the town of Chester on July 24, 1926, its property and power plant and that its fair market value amounted to $27,228." The commission had been asked by the court to determine the value of the property conveyed and what property should have been conveyed. No substantial evidence was offered that the town was dissatisfied with the contents of the conveyance and there was no serious dispute as to its sufficiency. The commission did not enter into consideration of taxes said to be due from the company. Except for certain notes which have since been paid, it found that no mortgage or lien appeared against the property.

RULES FOR SERVICE EXTENSIONS IN HUDSON VALLEY.—The New York Public Service Commission has approved new general rules and regulations of the New York Power & Light Corporation for electric service furnished in Albany and the Hudson Valley, the territory in which it operates. A new method is established for extension of overhead lines in all territory for annual customers and to bring down to a simplified unit basis the guaranteed monthly minimum charge without restriction as to locality, territory or rates. It is based on definite length of line per applicant as follows: Extension per applicant, 440 ft. or less, $2. For each 110 ft. or major fraction thereof 50 cents is added. Where street lighting is obtained from consumers' lines, each $100 of annual revenue from street lighting will be considered as equivalent to an additional applicant for single-phase service. Each $100 of estimated annual revenue in excess of the minimum charge guaranteed annually by applicants for three-phase service will be considered as equivalent to an additional annual customer for single-phase service. As additional consumers or street-lighting units are placed in use on an existing extension the minimum charge to all consumers on the extension will be recalculated as if it were a new extension. For any contributions advanced by applicants the minimum charge will be reduced at the rate of 75 cents per $100 so contributed. Provision is made for grouping or averaging consumers for any existing or proposed line extension provided such grouping or averaging reduces the charge. Where a density of 25 annual consumers to the mile of distribution is reached the company will discontinue guarantees of the minimum charge and will apply the minimum of the appropriate classifications to portions of its distribution system contiguous to urban territory.

Recent Court Decisions

TIME LIMITATIONS ON STARTING ACTIONS FOR COMPENSATION.—Where, after a compensable injury has been suffered, neither of the parties in interest institutes proceedings to bring an adjudication of*the matters involved, and there is no evidence of a valid agreement of settlement between the parties that in any manner conforms to the requirements of the compensation statute, but by or with the direction or consent of the employer payments of compensation are promptly commenced and thereafter continued to the employee for a period of time, the Nebraska Supreme Court held, in Ashton vs. Blue River Power Company, that the twelve-month time limitation provided by the workmen's compensation law should not take effect until the expiration of one year from the time of making the last of such payments. In respect to the due enforcement and observance of the statute with respect to limitations upon commencement of actions, the court held that the public has an interest which the court must protect.

ACCEPTANCE OF SERVICE CONSTITUTES WAIVER OF OBJECTION TO ASSIGNMENT OF UTILITY.—In Pacific Gas & Electric Company vs. Universal Electric & Gas Company the District Court of Appeal in California affirmed a judgment for the plaintiff, saying that where a contract for the sale of electrical energy by a power company at fixed rates provided that it should bind successors of both parties and contained no stipulation against assignment, and there was nothing under it to show that skill or other quality peculiar to the power company or to the nature of the service was a material inducement to the contract, it appearing that the purchaser, without objection except as to the rate charged, accepted deliveries from the assignee of the seller and made monthly payments on account, such circumstances sufficiently indicated a waiver of objections to the assignment. A contract filed in accordance with the public utilities act with a copy of the proposed lease and assignment became part of the assignee's fixed schedule of rates. 271 Pac. 377.)*

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

News About Men of the Industry

District Managers Assigned to New Territory

C. E. Houston, district manager of the Southern California Edison Company at Pomona, will be the division district manager of the eastern division of the company to be established the first of the year. The new division will include Pomona, Redlands, San Bernardino, Ontario, Monrovia and Covina. Santa Barbara, Ventura, Santa Paula, Oxnard and Ojai are to be known as the northern division, with R. R. Walbridge as division manager. . Several other changes are scheduled to take place Jan. 1, 1929, in the commercial organization of the Edison company. Myron McNeal, district manager of the Montebello district, will become district manager of both the Montebello and Vernon districts and John White, district manager of Hanford, will be transferred to Tulare as district manager. H. S. Williamson, district manager in Redlands, retires from actual duty on Jan. 1. His position will be filled by the transfer of Paul V. Moffat, present district manager of Delano. C. M. Campbell, who has been connected with the Pasadena district, is to be promoted to district manager at Oxnard and W. J. Keil, power specialist in the Oxnard district, will become district manager at Hanford.

G. B. Miller of Oelwein, Iowa, has been appointed general manager of the Interstate Power Company, Clinton, Iowa, to succeed Thomas Crawford, resigned.

Marion Lones has been appointed general superintendent in charge of operations of the entire system of the Eastern Minnesota Power Company, Pine City, Minn., to succeed J. W. A. Drummond, who recently left for Portland, Ore. Mr. Lones has been connected with the company for twenty years and for the past ten years has been superintendent of overhead construction. R. E. Hageman of Mora, Minn., will succeed Mr. Lones as superintendent of overhead construction.

H. Lee Jones, director of the Information Bureau of the Kansas Public Service Companies, has been appointed assistant to the vice-president of the Kansas Gas & Electric Company, Wichita, to succeed the late Col. R. H. Timmons. Mr. Jones will take up his new duties at Wichita Jan. 1. A former newspaper man, he has a wide acquaintanceship in public utility and industrial circles in the state of Kansas. For a number of years he was connected with the staff of the Topeka *Daily Capital*, subsequently becoming secretary of the Hays Chamber of Commerce. Six years ago he returned to Topeka as director of the new information bureau formed by the Kansas public service companies. Mr. Jones' duties include the supervision of the Kansas Gas & Electric Company's public relations activities, advertising and matters closely allied to that department. Mr. Jones for five years has been secretary of the Kansas section of the National Electric Light Association and probably will continue in that capacity.

Walter H. Burke Now in Boston

Walter H. Burke, formerly Southwestern district manager of Stone & Webster, Inc., has been transferred to the headquarters of the company in Boston. Mr. Burke is one of the best known executives in the Stone & Webster organization. Fifteen years ago he

W. H. Burke

was a student engineer in the Boston office, but subsequently was sent to Dallas, where his work was directed by the manager of the property. Later he was sent back to the Boston office and for seven years was assistant to the division manager in charge of the Southwestern district. In this position Mr. Burke gained valuable experience and was made manager at Keokuk, Iowa. A later appointment brought him to Houghton, Mich., and from there he went to Texas. Mr. Burke was made manager of the Northern Texas Traction Company at Fort Worth in 1925, and two years later became manager of the Southwestern district with headquarters in Houston, the position he held before his recent transfer to Boston.

Major D. W. Blakeslee, Corps of Engineers Reserve, has been promoted for duty in time of war as chief of administration branch, supply section, office of chief of engineers, Washington, D. C. Major Blakeslee specialized for many years in iron and steel works electrical engineering, having been employed by the Youngstown Sheet & Tube Company, the Carnegie Steel Company and the Jones & Laughlin Steel Corporation. He now devotes most of his practice to lighting problems as illuminating engineer of the Pittsburgh Reflector Company.

C. W. Kellogg, president of the Engineers Public Service Company, has been elected a director of Air Investors, Inc., and Frederick S. Pratt, chairman of the board of directors of the Puget Sound Power & Light Company, has also been elected to the directorate of that organization.

C. L. Owen of Enid, assistant manager of the northern division of the Oklahoma Gas & Electric Company, has been appointed acting manager of the division by J. F. Owens, vice-president and general manager of the company. He takes the place of the late Lincoln Beerbower of Enid, who died in Oklahoma City Nov. 20.

Raines Kessler, formerly power sales engineer of the Georgia Power Company, has been appointed manager of the industrial department of the Philadelphia Electric Company. Mr. Kessler was born and educated in Philadelphia and prior to his connection with the Georgia Power Company was Southern manager of the American Engineering Company of Philadelphia with headquarters at Atlanta.

Arthur F. Potter, manager of the Empire District Electric Company at Carthage, Mo., and of the Carthage Gas Company for the past three years, has been transferred to Bartlesville, Okla., as manager of the Bartlesville Gas & Electric Company at Bartlesville and of the Union Public Service Company at Dewey, Okla. It was as an employee of the Bartlesville Gas & Electric Company that Mr. Potter first began work for the Doherty interests ten years ago.

Duncan S. Owler, assistant superintendent, has been appointed general superintendent of the Fall River Electric Light Company. Mr. Owler is a native of Providence, R. I., and a graduate of the Massachusetts Institute of Technology. He entered the meter department of the Fall River company in 1917 and has been in close touch with the electrical development of the organization during his progress to his present post.

E. G. Stahl, formerly manager of the San Joaquin district of the San Joaquin Light & Power Corporation since its formation in 1921, has been transferred to the power sales department at Fresno, specializing in agricultural problems. Mr. Stahl brings to his new work a broad experience covering many years of actual contact with farm conditions. Growing up in a farm community, he attended Kansas State University, from which institution he was graduated as an electrical engineer. In 1919 he was appointed manager of

the Los Banos district, which position he occupied until the formation of the San Joaquin district. The application of electricity to agriculture is a subject to which Mr. Stahl has given considerable attention. His studies have resulted in much valuable data on costs and economies in farm work.

C. B. McMANUS, who has been superintendent of district operations for the Georgia Power Company since July, 1927, has been promoted to the position of assistant operating manager.

M. R. McKINLEY, formerly general superintendent of the Lowell (Mass.) Electric Light Corporation, has been appointed general superintendent of light and power of the Tampa Electric Company to succeed Charles F. Terrell, who has assumed new duties at Beaumont, Tex.

LOUIS F. ROBINSON, Prospect, N. Y., has been appointed superintendent of the hydro-electric generating stations of the Utica Gas & Electric Company, after 30 years of service. Mr. Robinson now has charge of the stations at Trenton Falls, Newport, Dolgeville, Little Falls and Holland Patent, N. Y. He entered the employ of the company in 1898. Mr. Robinson supervised the development of Trenton Falls in 1900 and has assisted in other developments.

GEORGE W. MASON, formerly president of Copeland Products, Inc., was elected a director, chairman of the board and general manager of the Kelvinator Corporation at the regular meeting of the board of directors. Mr. Mason has had broad experience in the various branches of business, including manufacturing, banking, engineering, finance and sales. He severed his connection with the Chrysler Motor Corporation in 1926 to become vice-president and general manager of Copeland Products, Inc. Early this year he was elected president.

THOMAS CRAWFORD, general manager of the Interstate Power Company, Clinton, Iowa, has announced his resignation following an association with the Clinton properties which covers a period of 23 years. A native of Sterling, Ill., and a graduate of the University of Illinois, Mr. Crawford became superintendent of the Sterling Gas & Electric Company immediately after graduation. In 1905 he removed to Clinton, and since that time he has been prominently identified with local public utility interests. Mr. Crawford is a past-president of the Iowa Electrical Association.

R. I. GILLILAND, formerly connected with the Pennsylvania group of properties of the Associated Gas & Electric Company, and more recently identified with the Northern States Power Company, Minneapolis, has left for Manila, P. I., to take up his duties as electrical manager in charge of operation and sales of the Manila Electric Company, a part of the Associated System. Mr. Gilliland has had both operating and sales experience in the electrical industry as well as in other fields of endeavor. From 1912 to 1918 he was with the Pennsylvania group, at first engaging in transmission line surveys, then in the engineering department and later devoting his time to sales. Finally he was named assistant superintendent of the Philipsburg division. In 1918 Mr. Gilliland became general manager and engineer of a coal mining equipment company, four years later affiliating himself with the Byllesby organization.

GRADY A. SMITH, for the past ten years manager of the Benton (Ark.) electric light and water plants, has resigned to devote himself to personal interests in Florida.

R. W. CURRAN, manager of the Bartlesville Gas & Electric Company, a Cities Service subsidiary, has resigned to become manager of distribution in Arkansas for the Arkansas Natural Gas Corporation of Shreveport, La., which has been acquired within the last year by the Cities Service Company. Mr. Curran is a veteran employee of the Cities Service organization, entering its employ in 1910 and serving in more than a dozen positions, including those in Denver, Buffalo, N. Y.; St. Joseph, Mo.; Warren and Portsmouth, Ohio, and Kansas City, Mo. He is succeeded in Bartlesville by A. F. Potter, formerly manager of the Carthage (Mo.) Gas Company, one of the group of Gas Service organizations.

JULIAN C. SMITH of Montreal, vice-president and general manager of the Shawinigan Water & Power Company, has been elected a director of the Royal Bank of Canada. Mr. Smith is also president of the Montreal Tramways Company, United Securities, Ltd., the Quebec Power Company and the Canadian Carbide Company and is also vice-president of the Dominion Engineering Works, Ltd.

Obituary

RICHARD A. HALE, consulting engineer of the Essex Company, Lawrence, Mass., and for many years one of the best-known hydraulic engineers in New England, died at his home in Lawrence Dec. 17 at the age of 75. He was a past-president of the Boston Society of Civil Engineers, an authority on the flow of the Merrimac River and was keenly interested in hydro-electric development.

EDWARD P. CLIFFORD, vice-president of the Bell Telephone Laboratories, died of bronchial pneumonia Dec. 16 at his home in New York. Mr. Clifford had been the commercial manager of all research work of the Bell Telephone Laboratories since 1925, an important period in the way of experimentation in television, transatlantic telephony and the transmission of pictures by wire. Mr. Clifford's entire business career was spent in the employ of the Western Electric Company and in 1925, when the engineering department became the Bell Telephone Laboratories, Mr. Clifford as vice-president was placed in charge of the general staff. He was a member of the American Institute of Electrical Engineers, the Telephone Pioneers of America and other similar organizations. Mr. Clifford was 53 years of age.

EDWARD R. WELLES, president of the Public Industrials Corporation, New York, and consulting mechanical engineer to the J. G. White Engineering Corporation, died Dec. 15 at his home in Brooklyn after a brief illness. Following graduation from Stevens Institute of Technology in 1900 he formed an association with the J. G. White Engineering Corporation which he maintained continuously as a consulting expert, as chief mechanical engineer and in various other executive capacities. In the course of his career he had been consultant to the electric power equipment division of the War Industries Board, particularly in connection with the Muscle Shoals power project; to the Associated Gas & Electric System, the Central Hudson Gas & Electric Company and he had also professional relations with the Carnegie Steel Company, New Amsterdam Gas Company, the International Pump Company and other industrial undertakings. Mr. Welles was 50 years of age.

LEWIS H. LATIMER, electrical engineer and a member of the Edison Pioneers, died at his home in Flushing, L. I., Dec. 11 in his eightieth year. A colored gentleman, born in Chelsea, Mass., of escaped slaves, Mr. Latimer was thrown upon his own resources at fifteen years of age with hardly more than a primary school education. He became interested in draughting work in the office of Crosby & Gould, patent attorneys, and gradually perfected himself to such a degree as to become chief draughtsman. Among other patent applications he assisted in preparing was the telephone patent of Alexander Graham Bell. He invented a successful method of producing carbon filaments for the Maxim electric incandescent lamp, securing a patent for it; he also made other inventions. In the fall of 1881 Mr. Latimer was sent to London, England, to establish an incandescent lamp department for the Maxim-Weston Electric Light Company. When the Board of Patent Control of the General Electric and Westinghouse Electric companies was formed, in 1896, Mr. Latimer became its chief draughtsman, continuing until 1911, when the board went out of existence and he entered the employ of Edwin W. Hammer, consulting engineer. While he had been retired for several years, he maintained to the last his cordial interest in the men with whom he had been associated for so long.

Financial and Statistical News

M. S. Sloan Says Consolidation Lowers Financing Costs

Discussing various aspects of the recent merger of New York utilities, Matthew S. Sloan, president of the New York Edison Company, placed special emphasis on the financing benefits. He pointed out that operation of the group of properties as a single system allows of the most complete and efficient employment of capital already invested in plants and equipment. It enables the company to keep the most efficient generators working to full capacity, using the less efficient ones only when necessary. Since the stations are tied together there is less idle generating capacity in reserve and therefore the least possible unemployed investment.

Furthermore, Mr. Sloan pointed out, a smaller new capital investment to take care of growth is necessary. He said: "When new financing becomes necessary it means that money can be hired on the most advantageous terms; even more advantageous than had been possible in the past, although the companies as individual entities were large enough and sound enough financially to command good credits and good terms in acquiring new capital."

Pacific Gas Electric to Issue More Stock

The Pacific Gas & Electric Company is planning to issue to its common-stock holders at par ($25) additional common stock in the ratio of one share of new stock for each ten shares held. This action is subject to the approval of the California Railroad Commission. The offering, representing the fourth issue of stock at its par value, will be made to stockholders of record Feb. 8, 1929. The directors have declared the regular quarterly dividend of 2 per cent on the common stock, payable Jan. 15, 1929, to holders of record Dec. 31, 1928.

Cities Service Issues Rights to Stockholders

Following a special meeting of the board of directors of Cities Service Company held Dec. 17 it was announced that the company would give its 100,000 common stockholders an opportunity in the form of rights to purchase additional common stock at $65 per share on the basis of one share for every ten shares owned. The current market price of Cities Service common stock is about $90 per share. The rights to buy at this special price will be issued to registered holders of record at the close of business on Jan. 8, 1929, and must be exercised on or before Feb. 7. Holders of Cities Service Company debentures, due 1963, to which are attached warrants to purchase Cities Service common stock will also be given the opportunity to participate in the rights through a special arrangement of the company by means of which these debenture holders may become stockholders before the closing date.

The offering of these rights is in line with the company's policy of giving its common stockholders a further opportunity of sharing in its profits. Cities Service Company has had record earnings in recent years; in the twelve months ended Oct. 31, 1928, net earnings reached a high mark of $32,714,000. The funds from this financing which may total as much as $40,000,000, will be used for further expansion, including new construction work, additions to subsidiary properties and for other corporate purposes.

R. H. Ballard Says Power Sales Will Double by 1935

DISCUSSING the immense indicated growth of the utility industry immediately ahead in a paper prepared for the twenty-second annual convention of the Association of Life Insurance Presidents, R. H. Ballard, president of the Southern California Edison Company, predicted that 1935 would see power sales of 120,000,000,000 kw.-hr. The total investment by that time he placed at $16,000,000,000. Relative to the outlook, the paper proceeds:

New highways of power are to be built and the capacity of others to be increased. As one outlet for electric service approaches the saturation point, some entirely new application comes forward to command the attention of the industry. The electric range and the electric refrigerator will multiply the present domestic market at least five times. The employment of electric heat in industrial applications will be equal to the entire horsepower of electric motors used in factories and shops. Thousands of horsepower will be required for the electrification of steam railroads—a development that is waiting just around the corner. Millions of dollars will be spent within the next few years for the lighting of highways and airports. All of this is in addition to the normal growth of the business in keeping with the increase in population.

Through the customer-ownership plan a wide market has been opened up for the sale of junior securities, but the electric industry, like any other large producer, must continue to come into the big money market with its bonds. We do this with full confidence that our record will stand microscopic examination. Ours is a business which is not subject to the ups and downs of many commercial and manufacturing enterprises. The electricity which lights this room is made at the same instant it is consumed. Our product cannot be exported, neither can it be imported from foreign countries; hence we are in a position to make remarkably exact calculations for the future. We prepare monthly reports which are available to any interested person. We operate under the recognized principle of regulated monopoly. The industry has shown a spirit of commercial aggressiveness of which we are proud. Our service increases the productive capacity of the nation, resulting in a financial surplus for wage earners, enabling them to pay larger insurance premiums and to contribute to surplus, a portion of which we borrow from time to time so that we may render a still wider service.

Not long ago more than 150 trucks left the garages of the Southern California Edison Company, each truck carrying a crew of linemen and a supply of materials. In our territory we install a new meter every five minutes of the working day. During the next five years we will spend $130,000,000, mostly for extensions to the distribution system. During 1928, which is the first year under our revised program which we term "the commercial era," we have sold 300,000 hp. in new business—an increase of 40 per cent over the previous year. The plans for 1929 call for 375,000. For the past twenty-five years our energies have been concentrated on problems of plant construction and general finance. These departments now rest on very strong foundations, enabling us to take advantage of the expansive character of the times. You will find the same conditions in any well managed electric utility in any part of the country. We are on the eve of a tremendous extension in the commercial application of electricity, which is inevitable, because in every field electricity is quicker, cleaner, cheaper and more convenient than any other medium.

New Utility Company Organized

With the purpose of acquiring and operating directly or through subsidiaries public utility properties in South America and other countries the Intercontinents Power Company has been formed. The company owns the entire outstanding capital stock (except qualifying shares) of certain electric light and power companies in Argentina and Chile. These subsidiary companies have acquired or have under contract 36 electric light and power properties with approximately 12,000 hp. installed capacity and serve without competition 15,427 consumers in communities having an estimated population of 278,000. The authorized capitalization consists of 6 per cent debentures, series A, due 1948; cumulative preferred stock to the amount of 200,000 shares; class A common stock, numbering 500,000 shares, and class B common stock, numbering 500,000 shares.

English Interests to Invest in American & Foreign Power

The American & Foreign Power Company has entered into an agreement with J. H. Macdonald of London, England, acting on behalf of Whitehall Electric Investments, Ltd., or a new corporation or corporations to be organized by it, whereby American & Foreign Power has obligated itself to sell to Mr. Macdonald for the purchase price of $19,600,000 the following securities: One hundred thousand shares of American & Foreign Power $6 preferred stock and $10,000,000 principal amount of 6 per cent collateral notes of the South American Power Company. All of the South American Power securities are now owned by American & Foreign Power.

At the time arrangements were completed with the Whitehall Electric Investments for the acquisition of its Mexican and Chilean public utility holdings early in October London reports indicated that the purchase price was about $53,400,000. The properties involved included all the public utility operations in Santiago and Valparaiso, in Chile, and the power and light systems in Vera Cruz, Tampico, Puebla and Orizaba, the street railways in Vera Cruz and Puebla, and a wholesale power business in Cordoba, in Mexico. All these properties combined have annual gross revenues of about $15,000,000.

The outgrowth of the earlier transactions was outlined in the American & Foreign Power Company's application to the New York Stock Exchange for the listing of 100,000 additional shares of $6 cumulative preferred stock of no par value.

Produce Exchange Lists Many Utility Securities

The New York Produce Exchange, which started trading in stocks and bonds last Wednesday, listed many securities of electric light and power companies. The list included the following: Alabama Power $5 preferred and $6 preferred; Allied Power & Light $5 preferred, $3 preferred and common; American Superpower $6 preferred; Associated Gas & Electric $6.50 preferred, common and common rights; British Columbia Power A $2 participating; Calgary Power Common; Columbus Railway, Power & Light, 6 per cent preferred and 6½ per cent preferred B; Electric Investors 6 per cent preferred; General Gas & Electric, dividend participating certificates; General Public Utilities $7 preferred; Potomac Edison 6 per cent preferred; Quebec Power common. The bond list included the following: Alabama Power first and refunding 5s series of Sept. 1, 1968; Associated Gas & Electric cons. refunding 5 per cent debentures, due Oct. 1, 1968, and 4½s (not convertible), due Jan. 1, 1953; Binghamton Light, Heat & Power first refunding 5s, due Feb. 1, 1946; Birmingham Electric first and refunding 4½s, due March 1, 1968; Central Illinois Public Service first 4½s, series F, due Dec. 1, 1967; Central Power & Light first mortgage 5s, due Aug. 1, 1956; Commonwealth Edison first collateral G, 4½s, series O, April 1, 1956; Dayton Power & Light first and refunding 5s, due June 1, 1941; Derby Gas & Electric first lien 5s, series of 1946; Duke Power first and refunding 4½s series, due Dec. 1, 1967; General Public Utilities first and collateral trust 6½s, due April 1, 1956, series A; Houston Light & Power first lien and refunding 5s, series A, due March 1, 1953; and first lien and refunding gold 5½s, series C, due March 1, 1954; Illinois Power & Light first refunding 6 per cent, due April 1, 1953, series A, and first refunding 5 per cent, due Dec. 1, 1956; Indiana Service first and refunding 5s, due Jan. 1, 1950, series A; Jersey Central Power & Light first and refunding twenty-year sinking fund bonds, due Feb. 1, 1945; Mississippi Power & Light first 5s, due Dec. 1, 1957; Nevada California Electric first 5s, due April 1, 1956; New England Power Association debentures 5s, due April 1, 1948; New Orleans Public Service guaranteed 4½s, due July 1, 1935; Oklahoma Gas & Electric first mortgage gold 5s, due March 1, 1950. Public Service of New Hampshire first and refunding gold bonds of 1957.

Customer Ownership Active in Northern New England

Colonel Farnham Discusses Development of Movement in that Section of the Country and the Conditions Which Are Making for Its Success

ONE customer family in five in many towns served by the Central Maine Power Company owns stock in this utility and the average for the state as a whole is one family in fifteen. In a recent address before the Public Relations Section of the New England division, N.E.L.A., Col. F. H. Farnham, manager of the securities department, New England Public Service Company, Augusta, Me., outlined the trend of customer ownership in northern New England during the past few years and declared that most underlying power preferred stocks can now be rated in the same class as second mortgage bonds.

"Customer ownership began to increase rapidly under war conditions," said Col. Farnham. "Power and light companies found themselves in 1918 with rapidly increasing costs and relatively slow increasing revenue. In general, properties were small compared with today, and they were in urgent need of capital. Taking a leaf from the Liberty Loan drives, they turned to the new reservoir for capital—their customers. The arrangement was mutually beneficial. Companies gained urgently needed capital at lower rates than was possible from the then hard-pushed bankers. Both public and employee relations were bettered.

"In this operation the companies were going to a class of people, largely savings banks customers, who were rarely approached by other than salesmen of poor, 'frozen' or 'gold brick' investments. As customer-ownership money was largely drawn from savings banks the plan met with more or less resistance from the bankers, depending upon the strength of the company. In most cases the bankers looked with alarm on this new movement and strongly advised the inexperienced to 'Buy stocks of no kind.' This, apparently, was the only serious obstacle to customer ownership at that time.

"The customer investor gained, first, a higher rate of interest than he had been receiving from the bank; second, practically all customer-ownership securities appreciated in value; third, the investor was able to get his money out quickly with little or no loss in his capital investment. In practically all cases a resale market was maintained so that customer ownership stock was not frozen; fourth, many customers were able to start a savings plan under conditions more favorable than had been offered by the savings banks by availing themselves of the partial-payment plan; fifth, the investor obtained a more intimate knowledge of his utility and its policies through the information disseminated among the stockholders by the management. . . .

"During the past ten years we have seen customer-ownership stock improve from what would have been classed as a 'speculative or business man's risk' to a high-grade investment stock. In fact, the better operating companies' preferred stocks are now looked upon as institutional investments and are sought out by insurance companies and trust funds of various kinds very much as power and light bonds were sought some ten years ago. Power and light bonds have improved till they are now one of the highest grade investments on the market. Most underlying preferred stocks can now be rated in the same class as second mortgage bonds. Most customer-ownership stocks have thus proved a very safe and profitable investment for the customer owner and have vindicated themselves with the bankers.

New Conditions Confront Utilities

"Because of the greatly improved position of customer-ownership securities several new conditions have come about. Briefly these may be referred to as follows:

1. The necessity for raising money by sales to customers has disappeared. The incentive for such sales, therefore, is purely from a public relations angle.

2. Since junior securities of operating companies and the better underlying holding companies are a high-grade investment, many are eagerly sought by institutional buyers. The cost of floating such securities is small and the broker will bid them off at prices almost as low or lower than they can be sold by the operating companies. Therefore, this easier way of financing is a great temptation to the company with securities to sell.

3. The older customer-ownership stocks have advanced in value and there has been a ready market for their resale. They are now sought out for trading purposes all over the country. This will mean a reduction in the number of customer-owners unless active measures are taken to increase the present list. . . .

4. As the size of customer-ownership issues have increased, the resale or remarketing of customer-ownership securities may become more of a problem in the future. This has been largely taken care of by the natural drift to larger investors or to institutional holdings and naturally will continue so as long as the securities put out are of an attractive nature to that class of investor.

Experience in Maine

"The Central Maine Power Company began customer ownership in 1905 during the days when street railways were looked upon as a better risk than electric light business.

"At that time the company was small but was able to sell its bonds to bankers at a price not too high. Its preferred stock was considered not too good as an investment and its common stock had little or no market. The company, being in need of funds for improvement, hired one full-time salesman who was able to peddle a sufficient amount of preferred stock to some of the company's customers to take care of most of the junior financing. This system was sufficient until 1917. The company maintained a resale for its stock, which was in the neighborhood of two points below the sale price. Fortunately, the resale of stock was a negligible quantity.

"In 1917 the heavy demand for increased service and consequent growth and capital caused the company to hire a larger full-time crew of salesmen and to go to work on customer ownership in a serious manner. At that time the high price of money and the high pressure on the bankers practically forced the company to enter the customer-ownership field to secure part of its money for financing. Since then the company has done all of its preferred stock financing by customer-ownership sales. This has been carried out through some ten employee campaigns and a full-time sales force, varying in size according to the situation. At the present time some $14,500,000 has been distributed among over 15,000 people.

"Between 1917 and 1928 we have seen our preferred stock change from one with a heavy sales resistance to one extremely well regarded. Within the past month the company put on an employee-stock-selling campaign to sell 3,000 shares in six days. They sold 4,800 shares in three days to 1,100 stockholders; over 800 of which were new ones!

"Incidentally, this preferred stock is diligently sought by every salesman of fake securities in Maine—it is now almost like Liberty Bonds in that respect. Maine is known as the dumping ground for fake securities. In consequence the turnover in stock is very heavy and our resale situation is probably more advanced than that of most companies in the country. Fortunately, the improved situation of the stock has caused this resold stock to be accumulated by the larger investor and the institutional buyer so that the resale market has not been a serious one. This condition promises to continue.

A Political Hot Poker

"Undoubtedly our customer-ownership policy has been of immense value to the company. Down in Maine every time a politician wishes to save the 'people' he gets the old 'water power' question down off the shelf, dusts it off, sets it on the fence and begins to take pot shots at it. Since our company is the biggest hydro-electric company in the state most of the bullets fired at the 'water-power' question hit us.

"There has been a tremendous change in public sentiment toward this question during the past five or six years and we are convinced that our customer-ownership policy is one of the greatest factors in bringing about this change. . . ."

Two New Utility Offerings Made

Gold debentures of the Delaware Electric Power Company to the amount of $8,000,000 were offered during the week ended Dec. 20 at 96½ and accrued interest, to yield about 5.75 per cent. These securities, bearing interest at the rate of 5½ per cent, were dated Jan. 1, 1929, and mature Jan. 1, 1959. Proceeds from the sale of the debentures will reimburse the company for the retirement of funded debt, and for other corporate purposes.

The Delaware Power & Light Company, the common stock of which will presently be owned by the Delaware Electric Power Company, issued first mortgage gold bonds to the amount of $3,100,000, the price being 94½ and accrued interest, to yield over 4.80 per cent. These bonds, dated Jan. 1, 1929, and maturing Jan. 1, 1969, will be secured by a first mortgage on the fixed properties to be presently owned by the company. Proceeds from the sale of these securities will reimburse the company for the retirement of funded debt of consolidating companies, and for other corporate purposes.

The Intercontinents Power Company, details concerning the formation of which are announced on page 1272, issued 6 per cent debentures, series A, totaling $4,500,000 at 96 and accrued interest, to yield 6.35 per cent. A warrant detachable after Dec. 1, 1929, was attached to each debenture entitling the holder to purchase in the ratio of twenty shares of class A common stock of the company for each $1,000 debenture at $25 per share until Dec. 31, 1930; at $27.50 per share until Dec. 31, 1932, and at $30 per share until Dec. 31, 1933.

Long Island Pays Dividend on New Stock.—Directors of the Long Island Lighting Company have declared a dividend of 10 cents per share on the outstanding 3,000,000 shares of common stock, no par value, payable Jan. 1 to holders of record Dec. 15. This is equivalent to $1 per share on the 300,000 shares of common stock, no par value, outstanding prior to the recent ten-for-one split-up.

Current Earnings Reports of Electric Light and Power Companies

	1928	1927	Per Cent Increase	Operating Ratio 1928	Operating Ratio 1927
American Water Works & Electric & Subs. (Year ended Oct. 31)					
Gross earnings	$50,536,509	$48,510,829	4.2	51	52
Net earnings	24,483,840	23,044,864	6.2	..	..
Carolina Power & Light (Year ended Oct. 31)					
Gross earnings	8,971,770	8,851,644	1.0	50	53
Net earnings	4,511,926	4,126,646	9.0	..	..
Detroit Edison (Eleven mos. ended Nov. 30)					
Gross earnings	47,198,942	42,724,849	10.5	66*	68*
Net earnings	16,165,709	13,468,968	19.9	..	..
Federal Light & Traction (Year ended Oct. 31)					
Gross earnings	7,742,269	6,940,177	11.6	60	61
Net earnings	3,097,783	2,712,524	14.2	..	..
Illinois Power & Light (Year ended Oct. 31)					
Gross earnings	34,123,966	31,452,459	8.5	57	61
Net earnings	14,737,174	12,419,191	18.5	..	..
New Orleans Public Service (Year ended Oct. 31)					
Gross earnings	$18,323,497	18,405,716	—0.4	62	62
Net earnings	7,005,055	6,954,920	0.7	..	..
Texas Power & Light (Year ended Oct. 31)					
Gross earnings	9,679,490	9,353,780	3.5	53	55
Net earnings	4,524,410	4,158,789	8.8	..	..
United Light & Power & Subs (Year ended Oct. 31)					
Gross earnings	89,114,136	82,960,362	7.4	59	62
Net earnings	36,544,163	31,701,078	2.5	..	..
Utah Power & Light (Year ended Oct. 31)					
Gross earnings	10,929,500	10,638,925	3.0	49	48
Net earnings	5,599,054	5,562,343	1.0	..	..

*Operating expenses include reserves and taxes.

Business News and Market Conditions

Electric Sales Larger for Last Quarter

Sales of electrical equipment in each of the first three quarters of this year, as measured by reports of 86 leading manufacturers, showed an increase over last year's, with orders booked for the third quarter the largest ever reported in any single quarter, according to *Standard Statistics*. Orders for the last quarter of this year promise to equal, if not exceed, those for the third quarter. The largest factor in the increased electrical equipment business has been the high level of industrial activity. Most basic lines have experienced a smaller seasonal reduction in production schedules than is usual, and a substantial improvement in operations is practically assured after the first of the year. Not only are further large equipment orders expected from those prosperous industries which have been large-scale buyers this year, but there is also an improved demand indicated from a number of hitherto weakly situated industries, notably railroad equipment and textiles. All this has added to the volume of equipment business.

Equipment Exports Increase Almost 9 per Cent

Exports of electrical equipment to all countries during the first ten months of 1928 totaled $89,622,824, which is an increase of approximately 9 per cent over the total for the same period of 1927. Important increases were shown in exports of generators, steam turbines, generator sets and accessories, as well as in metal filament electric lamps and radio receiving sets.

Exports of equipment by products and by countries are shown below.

Value and Destination of Electrical Exports for October

(Issued by Bureau of Foreign and Domestic Commerce)

Article	October 1927	October 1928
Generators:		
Direct current—		
Under 500 kw.	$53,917	$110,240
500 kw. and over	5,700	30,109
Alternating current—		
Under 2,000 kva.	7,740	33,228
2,000 kva. and over	.....	47,780
Steam turbine generator sets	109,617	147,156
Accessories and parts for generators	61,865	126,488
Self-contained lighting outfits	126,071	80,804
Batteries:		
Flashlight batteries	206,763	221,191
Other dry and wet cell primary batteries	193,812	238,355
Storage batteries	313,903	353,748
Transforming or converting apparatus:		
Power transformers	62,702	.....
Power transformers, 500 kva. and over	.....	156,154
Distribution transformers, less than 500 kva.	.....	87,090
Other transformers	105,375	.....
Instrument transformers	.....	1,415
Other transformers, not elsewhere specified	.....	101,179
Battery chargers under 15 amp.	.....	29,011
Rectifiers, double current and motor generators, dynamotors, synchronous and other converters	155,223	68,289
Transmission and distribution apparatus:		
Switchboard panels, except telephone	114,193	82,325
Switches and circuit breakers over 10 amp.	151,962	187,143
Fuses and fuse blocks	29,530	45,057
Watt-hour and other measuring meters	29,497	93,399
Volt, watt, and ampere meters, and other recording, indicating, and testing apparatus	190,790	.....
Electrical indicating instruments	.....	54,833
Electrical recording instruments	.....	14,176
Other electrical testing apparatus	.....	94,591
Lightning arresters, choke coils, reactors, and other protective devices	38,601	77,455
Motors, starters, and controllers:		
Motors under 1 hp.	$211,021	.....
Motors ¼ hp. and under	.....	$197,496
Motors over ¼ and under 1 hp.	.....	71,229
Stationary motors:		
1 to 200 hp.	242,049	259,755
Over 200 hp.	27,509	34,116
Railway motors	62,107	17,455
Electric locomotives—		
Railway	184,032	11,622
Mining and industrial	24,412	17,149
Station and warehouse electric motor trucks	16,579	6,429
Starting and controlling equipment—		
For industrial motors	127,146	150,611
For electric railway and vehicle motors	10,526	7,482
Portable electric tools	72,396	108,983
Accessories and parts for motors	235,574	233,804
Electric appliances:		
Electric fans	46,956	53,451
Electric lamps—		
Metal filament	133,722	175,291
Other electric lamps	46,920	62,903
Flashlights	203,479	178,606
Searchlights and projectors	37,596	60,453
Motor-driven household devices	174,380	.....
Electric vacuum cleaners	.....	120,479
Other motor-driven devices, except tools	.....	55,207
Domestic heating and cooking devices	138,037	.....
Electric flatirons	.....	44,896
Electric cooking ranges	.....	20,572
Other domestic heating and cooking devices	.....	89,302
Industrial electric furnaces and ovens	27,293	97,360
Therapeutic apparatus, X-ray machines, galvanic and faradic batteries, etc.	131,781	135,841
Signal and communication devices:		
Radio apparatus—		
Transmitting sets and parts	41,236	80,522
Receiving sets	325,669	628,692
Tubes	77,396	115,103
Receiving-set components	260,144	363,204
Receiving-set accessories	324,890	326,449
Telegraph apparatus	$46,803	$110,822
Telephone apparatus—		
Telephone instruments	36,715	44,960
Telephone switchboards	13,296	40,789
Other telephone equipment	174,553	163,356
Railway signals, switches and attachments	78,378	65,047
Bells, buzzers, annunciators and alarms	53,929	20,636
Other electric apparatus:		
Spark plugs, magnetos, and other ignition apparatus	192,178	.....
Spark plugs	.....	123,843
Other starting, lighting, and ignition equipment	.....	58,507
Insulating material	127,160	162,510
Metal conduit, outlet and switch boxes	92,518	131,816
Sockets, receptacles, and lighting switches	140,811	152,824
Electric lighting fixtures, interior and street	172,192	.....
Electric interior lighting fixtures	.....	191,724
Electric street lighting fixtures	.....	82,874
Other wiring supplies and line material	101,626	105,713
Other electric apparatus not elsewhere specified	501,375	746,097
Rubber and friction tape	26,644	49,923
Globes and shades for lighting fixtures	43,184	60,510
Electrical glassware except for lighting	15,504	53,044
Electrical porcelain:		
For less than 6,600 volts	35,316	40,956
For 6,600 volts and over	75,783	62,102
Carbons, carbon brushes, and electrodes:		
Electrodes for electric furnaces	141,309	188,043
Other carbon products	89,785	52,497
Insulated wire and cable (iron or steel)	14,394	19,871
Copper, bare wire	72,120	326,123
Copper, insulated wire and cable	275,958	438,273
Refrigeration sets up to 1 ton capacity	204,220	444,940
Domestic washing machines	109,591	168,165
Totals (October)	$7,975,453	$10,311,643
Totals (ten months)	$82,228,344	$89,622,824

DESTINATION OF ELECTRICAL EXPORTS

Country of Destination	October, 1928 Value
EUROPE:	$1,774,335
Belgium	80,341
France	149,851
Germany	111,009
Italy	123,726
Netherlands	61,966
Spain	181,717
Sweden	35,728
United Kingdom	745,978
Other countries	284,019
WESTERN HEMISPHERE:	$6,448,071
Canada	3,361,066
Mexico	496,325
Cuba	504,411
Argentina	555,051
Brazil	454,265
Chile	204,326
Colombia	236,501
Peru	68,949
Venezuela	118,524
Other countries	448,653
ASIA, AFRICA AND OCEANIA:	$2,089,237
British India	248,816
China	155,737
Japan	442,479
Philippine Islands	186,203
Australia	414,313
New Zealand	157,646
Union of South Africa	186,485
Other countries	297,558

Market Conditions

WHILE somewhat quiet in the New England district, buying activity in electrical equipment continues decidedly active elsewhere along the Atlantic seaboard. As has been the case for some weeks the power companies are ordering equipment in large volume both in the Central and Southeast districts. Transformers and generators feature this business.

As predicted, volume has expanded in the Middle West and is running along satisfactorily in the St. Louis area. Power companies continue to buy actively on the West Coast. The Puget Sound district reports some fairly large orders for motors, turbines and transformers, while pole-line hardware and distribution line material head the list of business farther south.

Metals Continue Quiet—Little Change in Prices

Little change has occurred in the non-ferrous metal market from the quiet condition reported last week, and with the holidays soon to come it seems unlikely that much activity will develop until the new year. Copper has sold in a little better volume, thanks to two large orders; the price remains at 16 cents for Eastern deliveries. Lead has undergone no price change either, but concessions were made on a little of the zinc sold. Tin is a fraction of a cent lower than last week, silver slightly higher than a week ago, and there is no change to speak of in the minor metals, though antimony is showing a slight upward trend.

NEW YORK METAL MARKET PRICES

	Dec. 12, 1928 Cents per Pound	Dec. 19, 1928 Cents per Pound
Copper, electrolytic	16	16
Lead, Am. S. & R. price	6.50	6.50
Antimony	9.6875	9.8125
Nickel, ingot	35	35
Zinc, spot	6.70	6.70
Tin, Straits	49.875	49.50
Aluminum, 99 per cent	24.30	24.30

Base copper wire price Dec. 19, 1928, 17¼ cents.

Active Power Apparatus Sales Reported in Southeast

Reasonably satisfactory activity is reported in the Southeast. A power company in Georgia ordered large power transformers costing $70,000 and switching equipment amounting to $50,000 in connection with a new substation job. A power company in Florida ordered rubber-insulated cable totaling $20,000. A South Carolina company ordered distribution transformers to the extent of $5,000, while a Georgia company ordered similar equipment totaling $2,200. Other central-station orders were for watt-hour meters amounting to $5,000, arresters totaling $4,400 and crossarms costing $2,000.

One of the larger contractors in the territory ordered varnished cambric cable amounting to $20,000, this material going into several cotton mill jobs now under way. The Goodyear Tire & Rubber Company has selected Gadsden, Ala., as the site for a new mill and the first unit, to cost $7,000,000, will be immediately constructed. Electrical materials amounting to $250,000 will be required for this unit. The Southern Bell Telephone & Telegraph Company has been issued a building permit covering a 25-story office building in Atlanta, involving $5,500,000, and construction on the first unit, to cost $1,000,000, will be started on January 1. Construction projects are as follows:

The Libbey-Owens Sheet Glass Company, Charleston, W. Va., will build an addition to its plant at Kanawha, W. Va., to cost $75,000. Bowling Green, Ky., contemplates a floodlighting system and beacon lamps at its proposed airport. The Southern Cities Power Company, Chattanooga, Tenn., plans a 44,000-volt transmission line, extending to the Alabama state line. The Hardwick Stove Company, Cleveland, Tenn., will build an addition to cost $90,000. The Samuel Stamping & Enameling Company, North Chattanooga, Tenn., will build an addition to cost $100,000. The Murray Corporation of America, Detroit, will build an automobile body plant at Memphis, Tenn., to cost $3,000,000. Durham, N. C., plans extensions in its street lighting system. The Southern Pile Fabric Company, Greenville, S. C., plans extensions to cost $100,000. Booneville, Miss., will receive bids until Dec. 31 for an ornamental lighting system. The Pullman Car & Manufacturing Company, Chicago, contemplates a plant at Birmingham, Ala., to cost $150,000. Montgomery, Ala., plans an airport floodlighting system and revolving beacons. The Augusta-Aiken Railway & Electric Company, Augusta, Ga., plans a transmission line to Louisville, Ga. The Georgia Power & Light Company, Valdosta, Ga., plans extensions in its power plant to cost $70,000.

Buying Is Quiet in New England

Less activity in buying was reported throughout the New England district. Orders for large electrical units and heavy equipment were few, while the demand for new motors among industrial plants was steady. One order amounting to more than $50,000 was reported and orders totaling over $55,000 were reported by another manufacturer. Small switch and control equipment indicate steady buying, but scheduled material orders show a slight slackening.

In view of the work now under contract for power development much optimism prevails for the trend in sales in 1929. Electric industrial furnace sales are active, one manufacturer reporting increasing interest and many sales in small-sized furnaces. Larger units are also attracting interest and a number of orders will soon be placed. Appliance sales are encouraging. Construction projects are as follows:

The New England Power Company, Worcester, Mass., will build a substation at Quincy, Mass., to cost $20,000. The Narragansett Electric Company, Providence, R. I., plans plant improvements to cost $1,000,000. The New England Telephone & Telegraph Company, Boston, will make extensions in underground and overhead lines at Woonsocket, R. I., to cost $32,936 and for loading coils between Providence and East Greenwich, R. I., to cost $21,400.

Sales Continue Strong in Eastern District

An excellent market tone continues in the Eastern district and primary equipment is in good demand. With central-station business developing to a very satisfactory level industrial account is growing more active and sizable commitments are in sight. A Connecticut power company has placed an order for two 12,500-kva. turbo-generators at a price of $350,000. A New Jersey central station has contracted for transformers to an amount of $120,000. An Illinois power company is about to close with an Eastern manufacturer for generators for a hydro-electric power development. A traction company in northern New York has purchased a quantity of transformers costing $30,000. Current inquiries indicate other orders for prime movers and affiliated equipment for central-station service at an early date, including requirements for two large power projects in New Jersey to total more than $10,000,000.

Industrial motors and control apparatus show improved demand. A textile manufacturer at Philadelphia has placed an order for motors and other electrical equipment for a large mill project in North Carolina. A New Jersey company lately organized to manufacture a material resembling paper will proceed with a new plant to cost $800,000 and has placed a contract for a motor-generator set to cost $75,000. A municipality in Michigan has ordered motors for pumping station service from a New York maker, to cost $50,000.

A metropolitan utility company has contracted for a quantity of paper-wound cable for low-tension service to an amount of $50,000. Electric refrigerating equipment is securing good sales and the outlook for continuance is excellent. Construction projects are as follows:

The Amalgamated Tablet Company, Brooklyn, will build a paper-manufacturing plant at Fort Edward, N. Y., to cost $100,000. The Virginia Barrel Company, Winchester, Va., has purchased property on Staten Island, N. Y., for a plant to cost $100,000. The Atmospheric Nitrogen Company, a subsidiary of the Allied Dye & Chemical Company, New York, plans a second unit at its plant at Hopewell, Va., to cost $35,000,000. The Signal Corps Procurement District, Brooklyn, will receive bids until Jan. 3 for 14,300 insulators (Circular 48); for a quantity of porcelain insulators and fittings (Circular 68); for switchboard supplies (Circular 57); for 12,000 ft. of telephone cable, 50-pair, lead-covered (Circular 65), and until Jan. 8 for a quantity of electrical supplies, including condensers, coils, terminals, rheo-

stats, etc. (Circular 63); for motor alternators in lots of 250 to 600, (Circular 62), for 70,000 ft. of wire (Circular 64), and for 400 ammeters (Circular 59). The Exolon Company, Blasdell, N. Y., plans an addition to its abrasive manufacturing plant to cost $80,000. The Metropolitan Greenhouse Manufacturing Corporation, Brooklyn, plans a plant at Greenridge, L. I., to cost $100,000. The Schnell Penselpen Corporation, New York, plans a factory at Arlington, N. J., to cost $100,000. The Kentucky Color & Chemical Company, Louisville, Ky., plans a plant at Kearny, N. J., to cost $150,000.

The John T. Lewis & Brothers Company, Philadelphia, plans an addition to its paint factory to cost $100,000. The Standard Tractor Company, care of the Commercial and Industrial League, Harrisburg, Pa., now being organized, plans a local plant to cost $100,000. The Youngstown Sheet & Tube Company, Youngstown, Ohio, plans an electric-operated mining and coal-washing plant at its coal properties near Nemacolin, Pa., to cost $750,000. Duquesne Light Company, Pittsburgh, will build a transmission line along the Allegheny River.

Power Companies Buying Equipment on Pacific Coast

Power company business looms large on the Pacific Coast. The Truckee River Power Company is in the market for 30 to 40 miles of distribution line material, comprising poles, crossarms and wire and hardware, the shipment being divided among Reno, Nev.; Truckee and Portola, Calif., for installation at the head of Feather and Truckee River canyons. The San Joaquin Light & Power Corporation is buying two carloads of assorted pole-line hardware. Other power company business includes special material, such as 20,000 ft. of assorted five- and eight-conductor armored control cable valued at $6,000 and 25,000 ft. of size No. 10 stranded heater cord in various colors valued at $1,000. Other business includes a 150-hp. motor for the East Bay, $5,000 worth of switches and miscellaneous outdoor material for an east side San Joaquin irrigation district, $2,500 worth of similar material for a west side irrigation area and a 1,000-kva. General Electric turbine for a paper company in southern California.

Sales of consequence reported in the Puget Sound district include $30,000 worth of transformers, two condensers for 5,000-kw. turbines and fifteen motors, for the Weyerhauser lumber mill at Longview and 50 small distribution transformers for a central station. Motor sales are at a minimum, the smallest week in the year being reported, but business along retail lines was never better. The city of Seattle opened bids for 5,000 15-amp., 125-volt plug fuses and made an award for $2,000 worth of remote metering equipment. The Pacific Telephone & Telegraph Company is planning a million-dollar underground telephone cable between Seattle and Everett, approximately 30 miles, and the Home Telephone & Telegraph Company plans expending about $12,000,000 in Oregon, Washington and Idaho during 1929. Equipment for the Ogden Point cold storage plant in Victoria, B. C., approximating $150,000, was purchased. Construction projects are as follows:

The Thaden Metal Aircraft Corporation, Alameda, Calif., plans a plant to cost $350,000. The Corona Foothill Lemon Company, Corona, Calif., plans an addition to its packing plant to cost $50,000. The Los Angeles Can Company, Los Angeles, plans a factory to cost $1,000,000. The Bergstrom Steel Company, Los Angeles, plans a plant unit to cost $75,000. The Willard Storage Battery Company, Cleveland, Ohio, plans a plant at Los Angeles, to cost $500,000. The Kings County Packing Company, Reedley, Calif., plans a plant at Oakland, Calif., to cost $200,000. The Southern Sierras Power Company, Riverside, Calif., plans an equipment repair, storage and distributing plant of six buildings, to cost $100,000. The California Pear Growers' Association, San Francisco, plans a cold storage and refrigerating plant to cost $1,000,000. Santa Barbara, North Hollywood, Los Angeles, Beaumont, San Francisco, Pinedale and San Gabriel, Calif., and Eugene, Ore., plan ornamental lighting systems. The Bureau of Yards and Docks, Washington, D. C., plans a power substation at Bremerton, Wash., to cost $80,000. The Washington Electric Company, Seattle, Wash., plans a hydro-electric power project on the Columbia River in Schelan and Douglas Counties, to cost $5,000,000 with transmission system. The Chandler Ice Company, Chandler, Ariz., plans a cold storage and refrigerating plant, to cost $50,000.

Business in St. Louis Is Normal

Business in all electrical lines has been fully up to normal for the season in the St. Louis district. A contract has been closed for the largest electrically operated shovel ever built, the electric equipment to cost $65,000 and the dipper to have a capacity of 15 yd. A 1,000-kw. transformer and a lot of motors were ordered for a mining company in southeast Missouri. A lot of motors of 100 hp. and over totaling $18,000 were bought by a mining company in the zinc fields of southwest Missouri. A bank of transformers costing $14,000 was purchased by a power company in the southern part of this district. Other orders worthy of mention are a turbine for driving auxiliary pump of 500 hp., another turbo unit costing $20,000, and a 500-hp. synchronous motor, costing $10,000. Construction projects are as follows:

The Texarkana & Fort Smith Railway Company, Kansas City, Mo., plans locomotive repair shops at Dowling, Tex., to cost $100,000. St. Louis, contemplates a floodlighting system and revolving beacons for an airport to be established in the northern part of city. The St. Louis Public Service Company, St. Louis, will build an addition to its mechanical shop and operating building to cost $45,000. The Knoll Aircraft Corporation, Wichita, Kan., plans a plant to cost $100,000. Muskogee, Okla., plans a floodlighting system and beacon lamps in connection with airport extensions to cost $195,000. Swift & Company, Chicago, meat packers, contemplate a plant at Muskogee, Okla., to cost $100,000. The Southern Ice & Utilities Company, Houston, Tex., plans an ice and cold storage plant at Kemp, Tex., to cost $50,000. The Mich-La Lumber Industries, Shreveport, La., plans expansions to cost $85,000.

Large Volume of Business in Middle West

Good business continues in most sections of the Middle West. Retail merchants report an unusual volume of holiday buying, with every indication that the present season will equal if not surpass any previous season. The steel and automotive industries are in a very favorable position and agricultural implement manufacturers are reported to be extremely busy. Utility companies are busy with maintenance and rehabilitation work and a very large program is planned for the Chicago district. Interesting orders placed include 5,400 Western red cedar poles, 815 Thompson meters of 10 to 3,000 amp. capacity, 62 600-amp., 15-kv., three-pole, single-throw, wheel-mounted oil circuit breakers and several construction orders aggregating $100,000. Commitments are large, one utility company averaging $175,000 per day. Jobbers' sales continue satisfactory. Construction projects are as follows:

The General Refrigeration Company, Beloit, Wis., contemplates an addition to cost $70,000. The Nash Motors Company, Kenosha, Wis., plans a plant unit at Racine, Wis., to cost $500,000.

The United Food Company, Chicago, contemplates a canning factory addition at Pigeon, Mich., to cost $75,000. The Michigan Smelting & Refining Company, Detroit, plans an addition to cost $85,000. The Grasselli Chemical Company, Cleveland, Ohio, plans a sulphuric acid plant at Ecorse, Mich., to cost $1,000,000. The Inland Lime & Stone Company, organized by the Inland Steel Company, Chicago, will build a plant at Manistique, Mich., to cost $200,000. The General Engineering Works, Chicago, plans an addition to its machine works to cost $65,000. Glencoe, Des Plaines and Brookfield, Ill., plan ornamental lighting systems. The John Deere Plow Company, Moline, Ill., plans a factory branch and distributing plant at Fort Wayne, Ind., to cost $150,000. The Dudlo Manufacturing Company, Fort Wayne, Ind., will build a unit at its wire and cable works to cost $75,000. The State Department of Public Welfare, Columbus, Ohio, is asking bids until Dec. 28 for a power house and equipment at the State Farm at Apple Creek, Ohio, to cost $88,000. The Gluntz Brass Foundry Company, Cleveland, Ohio, plans an addition to cost $80,000. The Gem Metal Shield Company, Dayton, Ohio, contemplates an addition to cost $65,000. The Chase Brass & Copper Company, Waterbury, Conn., plans a plant at Euclid Village, Cleveland, Ohio, to cost $750,000. The Geometric Stamping Company, Cleveland, Ohio, plans a plant at Euclid Village, Cleveland, to cost $450,000. The Troy Sunshade Company, Troy, Ohio, plans an addition to cost $65,000. The Iowa Public Service Company, Fort Dodge, Iowa, plans a transmission line at Algona, Iowa. The Central States Electric Company, Cedar Rapids, Iowa, plans a hydro-electric power plant on the Des Moines River, near Kalo, Iowa, with initial capacity of 30,000 kw. The Iowa Railway & Light Corporation, Cedar Rapids, Iowa, plans an operating and sales building at Marshalltown, Iowa, to cost $70,000.

Activities of the Trade

Graybar Employees Take Large Block of Stock

Announcement has just been made that 95 per cent of all eligible employees of the Graybar Electric Company have subscribed up to date to the $3,000,000 common stock of the company. Announcement of the sale of the company by its parent organization, the Western Electric Company, to employees of Graybar was made Nov. 6. The figures given out show that 1,639 out of approximately 1,700 eligible employees of the company have subscribed for stock under one or all three of the sales plans offered. The total number of shares actually subscribed for is 29,704, out of a total of 30,000 offered, at $100 per share. Approximately 27 per cent of all stocks purchased were taken care of on a cash basis. A. L. Salt, president of the company, stated that the annual business in electrical merchandise amounts to $75,000,000 a year. He stated that the company has a nation-wide system of wholesale houses for the distribution of products marketed by it, representing all of the larger cities and most of the important towns in every state. During September the company began an aggressive campaign for the expansion of its merchandising business, consisting of the sale of Graybar marked devices, such as radio receiving sets, washers, ironers, vacuum cleaners, fans, etc.

Expanding German Market for Storage Batteries

Although Germany is an important producer of storage batteries, sales of the American product, especially for automotive work, are steadily increasing, in spite of extremely keen price competition, according to a report issued by the Department of Commerce. Present indications are that this tendency will continue and that American storage battery manufacturers entering the German market are assured of a fair amount of business.

Great Britain and the United States are the main sources of origin of the storage batteries purchased by Germany. Great Britain supplied batteries worth 207,000 marks in 1927 and the United States furnished 437,000 marks' worth. Great Britain's storage-battery exports to Germany in 1926 formed about 50 per cent of the country's total foreign purchases, while the United States supplied one-third.

A recent survey of the market for batteries in Germany indicates that while there is a good demand for American storage batteries in the automotive trade there is much greater competition in the field of storage batteries for radio. The demand is for the smaller batteries, which retail on the local market at prices ranging from approximately $1.75 to $5. Radio sets operating from the light sockets and battery eliminators are appearing on the market, but owing to their high cost it will probably be some time before the general public will purchase them extensively. In general, the prices for American storage batteries are about 20 per cent higher than those of German make.

THE ELECTRO-NITE CARBON COMPANY, 306 North Fourth Street, Philadelphia, manufacturer of carbon brushes, announces that its Pittsburgh office is now in charge of Robert Graf and is located at 18 Market Street.

THE GOLD SEAL ELECTRICAL COMPANY, Cleveland, reports heavy sales of its 1-lb. irons in colors. They are made up in Delft blue, Chinese yellow, jade green and mandarin red, as well as in nickel and black shells.

Manhattan Electrical Buys United States Manganese

The Manhattan Electrical Supply Company, New York City, has purchased all the capital stock of the United States Manganese Corporation for $1,225,000. The company has acquired the right to mine minerals and stones from about 8,400 acres of government land in Augusta County, Virginia. While this property was acquired several months ago, activities up to the present have consisted of the development of properties and the construction of a suitable plant.

The net income for the company for the first nine months of the year totaled $39,259 after expenses and depreciation. The operating costs for the nine-month period amounted to $6,214,544, or more than 100 per cent of the total net sales of $6,176,675. On Sept. 30 last the company's financial position showed a slight improvement from the standpoint of working liquidity, totaling $3,903,427; the working capital was $986,576 larger, with ratio of current assets to current liabilities at 2.95 to 1.

Generators, Transformers, Motors and Fans Worth $312,576,294 in 1927

AN INCREASE of approximately 5 per cent in output of generators, transformers, motors and electric fans in 1927 over 1925 is reported by the Department of Commerce as the result of a census of manufactures just completed. The total was $312,576,294, against $298,010,383 for 1925, which was the last preceding census year.

Under the classification generators, motor-generator sets and automotive starter motors the aggregate value was $115,130,476, against $110,185,015 in 1925. Motors, motor parts and supplies, excluding automotive starter-motors, totaled $120,350,201, against $113,109,577. Electric fans reached a total of $10,484,283, a considerable drop from the 1925 figure of $12,562,636, while transformers, induction voltage regulators and current-limiting reactors aggregated $66,611,334, against $62,153,155.

Some of the more important items contributing to these totals were: Generators, steam-turbine driven, alternating-current, 483, valued at $8,741,001, with a total rated capacity of 1,846,167 kva.; other alternating-current, including synchronous condensers and frequency changers, 2,373, value $9,594,416, total rated capacity 1,783,904 kva.; automotive generators and starter-motors, 3,364,936 sets, valued at $62,992,264; self-contained power and light outfits (not over 5 kw. capacity, including engine, generator and control, but excluding storage batteries), 46,608, value $8,792,808; transformers—1 to 500 kva., 226,617, valued at $32,242,869; over 500 kva., 3,855, total rated capacity 10,085,470 kva., value $22,805,740; stationary motors, fractional horsepower, 2,876,990, valued at $32,504,952; 1 hp. and over, direct-current, 63,762, total rated horsepower 627,845, value $15,544,229; alternating-current, polyphase, 352,815, total rated horsepower 3,297,929, value $37,544,453; railway and vehicle motors (not including automotive starter-motors), 10,616, total rated horsepower 507,890, value $10,445,949. Electric fans, 650,805, valued at $10,484,283.

Tablet Marks Edison Shops

Formally dedicating a historical tablet marking the two small shops which he first occupied in Schenectady 42 years ago, Thomas A. Edison called attention to the phenomenal growth of a great industry then in its infancy. Speaking from his laboratories over WGY, after being introduced by Edwin W. Rice, Jr., honorary chairman of the board of directors of the General Electric Company, Mr. Edison said in part:

If it were not for the unveiling of this tablet today I should scarcely have realized that it was 42 years ago since I took the momentous step of moving the Edison machine works to Schenectady.

At that time the removal to such a distance was in the nature of a high adventure. The electric light and power business was moving onward and upward by leaps and bounds. We were long on orders, but short on money. But we managed to get money and continued to grow at an amazing pace.

In the past 42 years these two shops have developed into a vast manufacturing plant of 350 buildings on a 650-acre

plot, the present General Electric Company Works at Schenectady.

The commemoration service also included the reading of a letter from Samuel Insull, president of the Commonwealth Edison Company, who was the first executive of the original plant. The tablet was unveiled by Vice-President George F. Morrison, himself an Edison pioneer.

THE LOCKE INSULATOR CORPORATION, Baltimore, Md., announces that J. Upp has joined its sales staff, having severed his connection with the Ohio Brass Company.

THE COLT'S PATENT FIRE ARMS MANUFACTURING COMPANY, Hartford, Conn., announces that after Jan. 1 its Chicago office will be located in larger and more spacious quarters at 618 West Jackson Boulevard. Since 1922 the company has occupied offices at 35 South Desplaines Street, Chicago.

COMBUSTION ENGINEERING CORPORATION, New York City, reports that its affiliated company, the Hedges-Walsh-Weidner Company, Chattanooga, Tenn., has shipped to the Gulf States Creosoting Company an unusually large steel drum to be used for pressure creosoting. The shell is 140 ft. long, 8 ft. in diameter and has a plate thickness of 1 in. This is believed to be the largest steel drum ever shipped as a completely assembled unit.

THE WESTERN ELECTRIC COMPANY recently declared a special dividend of 25 cents in addition to the regular quarterly dividend of 75 cents, both of which are payable Dec. 31 to stock of record Dec. 26. The special dividend is paid from the award of the Official Claims Commission on account of German and other war claims. Western Electric Company's principal war claim was against Germany and covered damages on account of the German occupation of its factory in Antwerp during the war. The award with interest to Jan. 1, 1928, amounted to $2,259,078, a portion of which has already been paid under the "settlement of war claims act" adopted by Congress at the last session.

THE WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY has recently announced that in the manufacture of its horizontal generators for waterwheel drive it will employ fabricated steel for the stators, rotors and bedplates. The progress made in electric arc welding is responsible for abandoning the use of castings. The use of fabricated structural pieces, heretofore impossible because of space limitations in the generators, offers greater ruggedness and lighter weight than could be attained in the steel castings, it is claimed. The standard horizontal generator unit is of the two-bearing coupled type and may be arranged for an extended shaft for an overhung waterwheel runner. The electrically welded plate steel frames of the stator are designed to withstand the stresses incident to manufacture, erection and operation.

New Equipment Available

Trouble Light for Industrial Uses

A portable combination storage battery and adjustable spotlight for trouble shooting and emergency uses, providing 300,000 beam candlepower, which can be carried wherever needed, has been developed by the Portalite Company of Cambridge, Mass. It weighs 13 lb. and has non-spillable battery construction, permitting it to be carried and used in any position. It is claimed that the "Portalite" will light up the lines in good shape for two or three

sections and is good for about 3½ hours intermittent use or 2½ hours burning steadily, which is long enough for any ordinary trouble.

Fixture for Series or Multiple Service

In order to meet the demand for a street-lighting fixture which can be converted into a fixture for either series or multiple service, the Line Material Company, South Milwaukee, Wis., has brought out a complete line of fixtures known as the "Convertolite." It can be changed from a fixture for series service to one for multiple service by simply removing the porcelain body and reassembling the remaining equipment and making changes in the socket attachments for the multiple service socket. Either straight or right angle canopies are attached by four screws to the porcelain head for series service and to the refractor hood for multiple service. A straight canopy with porcelain bushings may be used for outer wiring when the canopy is attached directly to the refractor hood.

The body is of wet process porcelain tested for 30,000 volts flashover. Brass ears are attached to the porcelain, to anchor the leads, when outer wiring is used.

In some cases the demand is for an all-metal fixture for series service, in which case a long refractor hood is furnished. This longer refractor hood provides more space for the series socket and the larger lamps. The "Convertolite" can be fitted with any 8-in. Holophane refractor for the scientific control of light. Either a 20-in. radial wave or radial bowl reflector may be used in place of the refractor hood.

Improved Toggle Switch

A new toggle switch is now being manufactured and introduced to the trade by the Connecticut Electric Manufacturing Company of Bridgeport. This new switch is not only simple in construction, eliminating several of the parts used in the old style switch, but is also a strong and durable switch for general purposes. The manufacturers are so confident of its merits that they guarantee it for ten years.

The simplicity of the switch lies in the construction of the yoke and the attachment of the blades to the laminated bakelite carrier plate. All washers and the ordinary fiber insulation are eliminated. In their place is a single piece of phenolic insulation with arms extending on both sides of the yoke and held in place by a spring which also creates the necessary tension on the toggle. The blades are fastened directly to the laminated bakelite carrier plate without use of washers or other parts. The construction is such that the spring is in upright position and is the direct agent for moving the blades when the toggle is pushed. This provides unusually smooth operation.

Another improved feature is the manner in which the terminals are fastened to the cup, two screws being used instead of one. This makes it impossible for these parts to turn out of alignment with the blades when the switch is wired.

"Chromilite" Window Floodlight

The commercial lighting section of the Westinghouse Electric & Manufacturing Company has announced a new window floodlight, known as the "Chromilite" window floodlight, designed to supplement the illumination afforded by show window reflectors and for use where color effects are desired. It is also suitable for use in providing illumination for store and counter displays.

A film holder for four gelatin films, red, blue, amber and green, are available. The "Chromilite" has a small cast swivel base, permitting the mounting of the unit on wall or ceiling. A small, rectangular base for mounting on condulets or moldings is also provided. The reflector is of sheet brass, chromium plated. It is claimed that the chromium-plated surface makes an efficient reflector, is practically indestructible and will not tarnish or corrode.

Electrical Patents

Announced by U. S. Patent Office

(Issued Dec. 4, 1928)

17,150 (reissue). INSULATOR STRUCTURE; W. K. Naylor, Pittsburgh, Pa. App. filed Aug. 23, 1928.

1,693,617. ELECTRIC MOTOR; A. E. Oswald, Hackensack, N. J. App. filed Sept. 19, 1925.

1,693,630. INSULATING TUBE AND PROCESS OF MAKING SAME; H. H. Wermine, Chicago, Ill. App. filed April 15, 1922.

1,693,631. CONTROL APPARATUS; H. W. Williams, East Pittsburgh, and D. G. Boozer, Pittsburgh, Pa. App. filed Dec. 3, 1926.

1,693,635. TIME-CONTROLLED ELECTRIC SWITCH; D. L. Chandler, Boston, Mass. App. filed May 27, 1927.

1,693,663. SIGNALING SYSTEM AND MECHANISM; L. E. Oneal, East Orange, N. J. App. filed Nov. 13, 1923.

1,693,668. RECTIFICATION OF ALTERNATING CURRENT; E. Y. Robinson, Lymm, England. App. filed June 23, 1925.

1,693,670. ELECTRIC-WIRE SUPPORT; C. Salesas, Guantanamo, Cuba. App. filed Feb. 15, 1926.

1,693,679. FUSE PLUG; M. H. Terry, Columbus, Ohio. App. filed Oct. 21, 1926.

1,693,682. UNDERFLOOR DUCT SYSTEM; H. S. Walker, Ardmore, Pa. App. filed Aug. 26, 1926.

1,693,721. CLOCK-CONTROLLED SWITCH; H. P. MacLagan, Oak Park, Ill. App. filed Jan. 24, 1925.

1,693,725. IMPULSE-TESTING EQUIPMENT; M. L. Nelson, Park Ridge, Ill. App. filed Oct. 18, 1924.

1,693,794. ELECTRODE; H. W. Matheson and J. C. Smith, Montreal, Quebec, Can. App. filed Aug. 23, 1924.

1,693,848. CAP FOR GROUND MEMBERS; W. D. Kyle, Milwaukee, Wis. App. filed Oct. 23, 1922.

1,693,854. ELECTRIC FUSE PANEL; A. W. Minott, Ames, Iowa. App. filed June 3, 1926.

1,693,881. ELECTRIC TERMINAL CONSTRUCTION; H. A. Ziola, Toledo, Ohio. App. filed May 20, 1926.

1,693,884. REEL FOR CONDUCTING CORDS; C. Blessman, Jr., Toledo, Ohio. App. filed March 11, 1926.

1,693,893. AUTOMATIC INTERMITTENT-EXHIBITING DEVICE; J. Gage, Los Angeles, Calif. App. filed May 16, 1923.

1,693,925. LIGHTING FIXTURE AND THE LIKE; D. Holt, Chicago, Ill. App. filed May 23, 1927.

1,693,952. SAFETY SWITCH; E. G. Johansson, Boston, Mass. App. filed May 14, 1926.

1,693,968. SYSTEM FOR EXCITATION OF SYNCHRONOUS-TYPE ELECTRIC MACHINES; P. H. Thomas, Upper Montclair, N. J. App. filed July 26, 1924.

1,693,972. ATTACHMENT PLUG; F. L. Aimé, Spokane, Wash. App. filed Dec. 9, 1921.

1,694,039. SAFETY STOP FOR SEARCHLIGHTS; M. L. Patterson, Bogota, N. J. App. filed April 24, 1922.

1,694,054. SWITCH ON RECEPTACLE PLATE; T. A. Both, Stratford, Conn. App. filed Dec. 4, 1922.

1,694,056. LOCKING PLUG FOR EXTENSION CORDS; C. Calkins, Albany, Ore. App. filed June 16, 1927.

1,694,061. SELF-STARTING INDUCTION MOTOR; K. L. Hansen and W. J. Oesterlein, Milwaukee, Wis. App. filed Aug. 13, 1926.

1,694,062. DYNAMO-ELECTRIC MACHINE; K. L. Hansen, Milwaukee, Wis. App. filed Oct. 27, 1927.

1,694,067. THERAPEUTIC LAMP; W. T. Lewis, Racine, Wis. App. filed Oct. 27, 1927.

1,694,081. ELECTRIC WELDING MACHINE; W. E. Reed, Pittsburgh, Pa. App. filed Aug. 13, 1924.

1,694,121. ELECTRIC DISTANT-CONTROL DEVICE; E. Granat, Paris, France. App. filed Feb. 8, 1927.

1,694,141. ELECTRIC RECEPTACLE; J. W. Phelps, Chicago, Ill. App. filed May 24, 1924.

1,694,142. ELECTRIC FLASHER; J. W. Phelps, Chicago, Ill. App. filed Feb. 17, 1926.

1,694,151. RECTIFYING SYSTEM; H. F. Waite, New York, N. Y. App. filed July 16, 1926.

1,694,158. COMBINATION ELECTRIC WALL FITTING; T. A. Both, Stratford, Conn. App. filed Aug. 7, 1925.

1,694,159. MOUNTING FOR ELECTRICAL DEVICES; T. A. Both, Stratford, Conn. App. filed March 24, 1924.

1,694,160. EMERGENCY; CONVECTION HEATER; W. A. Brown, Philadelphia, Pa. App. filed Feb. 16, 1928.

1,694,216. ELECTRIC SWITCH; J. J. Gough, Chicago, Ill. App. filed June 27, 1927.

1,694,223. ELECTRIC SWITCH; G. N. Lemmon, Marietta, Ga. App. filed June 19, 1923.

1,694,237. CONTROL SYSTEM; D. T. Simonds, Schenectady, N. Y. App. filed Feb. 6, 1926.

1,694,239. ELECTRICAL BINDING POST; C. H. Thonsen, Brooklyn, N. Y. App. filed May 29, 1925.

1,694,240. TIME-ELEMENT DEVICE; L. S. Walle, Scotia, N. Y. App. filed Feb. 5, 1926.

1,694,241. INDUCTION-MOTOR-REGULATING SYSTEM; W. Weiler, Niederschonhausen, Germany. App. filed Nov. 21, 1925.

1,694,244. ELECTRICAL APPARATUS; E. F. W. Alexanderson, Schenectady, N. Y. App. filed Aug. 9, 1926.

1,694,247. ELECTRIC MOTOR; S. F. Briggs, Milwaukee, Wis. App. filed Aug. 28, 1922.

1,694,249. ELECTRIC REGULATOR; F. A. Byles, Schenectady, N. Y. App. filed June 17, 1926.

1,694,250. ELECTROMAGNETIC DEVICE; W. B. Clarkson, Schenectady, N. Y. App. filed Oct. 19, 1925.

1,694,253. REGULATING SYSTEM; P. W. Forsberg, Schenectady, N. Y. App. filed Nov. 3, 1925.

1,694,256. ELECTRIC SOLDERING CARBON; M. E. Gebel, Armour, S. D. App. filed March 30, 1928.

1,694,261. ELECTRIC SWITCH; J. D. Hilliard, Schenectady, N. Y. App. filed Aug. 26, 1925.

1,694,264. TEMPERATURE REGULATOR; A. W. Hull, Schenectady, N. Y. App. filed June 22, 1925.

1,694,276. ELECTRICAL CONDENSER; A. Möhrle, Stuttgart, Germany. App. filed April 5, 1927.

1,694,277. MEANS FOR REPRODUCING POSITION; E. J. Murphy and L. P. Hutt, Schenectady, N. Y. App. filed Oct. 9, 1924.

1,694,281. ELECTRICAL APPARATUS; D. C. Prince, Schenectady, N. Y. App. filed June 29, 1926.

1,694,282. ELECTRIC SWITCH; W. K. Rankin, Scotia, N. Y. App. filed Aug. 30, 1926.

1,694,288. INSTALLATION OF ELECTRIC APPARATUS; E. G. Sohlberg, Schenectady, N. Y. App. filed Feb. 24, 1927.

1,694,296. FREQUENCY-CHANGER APPARATUS; W. Weiler, Niederschonhausen, Berlin, Germany. App. filed April 16, 1927.

1,694,318. ELECTRIC INDUCTION APPARATUS; H. Grünholz, Charlottenburg, Germany. App. filed Jan. 13, 1928.

1,694,320. ELECTRIC SWITCH; J. D. Hilliard, Schenectady, N. Y. App. filed March 17, 1924.

1,694,321 and 1,694,322. SPEED-CONTROL SYSTEM; J. I. Hull, Schenectady, N. Y. Apps. filed Feb. 17, 1927.

1,694,351. AIR HEATER; W. L. Long, Kirksville, Mo. App. filed Feb. 28, 1928.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

An agency is desired in Breslau, Germany (No. 34,950), for radio and automobile accumulators and radio and automobile storage batteries.

An agency is desired in Johannesburg, South Africa (No. 34,938), for automobile electrical supplies, batteries and parts and cables and switches.

An agency is desired in Shanghai, China (No. 34,943), for household electric appliances.

An agency is desired in Prince Rupert, Canada (No. 35,031), for household electric appliances and electrical signs.

Purchase is desired in Milan, Italy (No. 35,024), of a mercury-arc rectifier.

An agency is desired in Berlin, Germany (No. 34,951), for household electric refrigerators.

New Trade Literature

OIL CIRCUIT BREAKERS AND GENERATORS.—Circular C-1803 issued by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., describes and illustrates its type 0-331 oil circuit breakers, electrically operated, for indoor and outdoor service. The company also is distributing leaflet L-3556-C covering its horizontal generators for waterwheel drive.

POWER FACTOR.—"Reducing the Cost of Electric Power" is the title of a catalog issued by the Electric Machinery Manufacturing Company, Minneapolis. The catalog contains many graphs and gives a non-technical explanation of power factor and shows when and how to apply capacitors to reduce electric power cost. The construction of the capacitors is explained and illustrations are given showing installations of the E-M capacitors.

SWITCHING EQUIPMENT. — Bulletin GEA-153A issued by the General Electric Company, Schenectady, N. Y., describes and illustrates its automatic switching equipment for waterwheel-driven generators.

SPEED REDUCERS.—The Falk Corporation, Milwaukee, has issued bulletin No. 190 covering the Falk speed reducers. This bulletin lists many new sizes of reducers, gives standardized uniform ratios, simplified rating tables and a new complete line of welded steel motor beds and contains illustrations showing installations of Falk units in various classes of industry.

DISTRIBUTION TRANSFORMERS. — Bulletin No. 160 issued by the Wagner Electric Corporation, 6400 Plymouth Avenue, St. Louis, describes and illustrates the Wagner distribution transformers in single-phase and three-phase, pole type and subway type, in ratings up to and including 500 kva. The construction of the distribution transformers and the ratings, shipping weights, prices, etc., are included.

AMPERE-HOUR METER. — The Sangamo Electric Company, Springfield, Ill., is distributing bulletin No. 76, covering the Sangamo ampere-hour meter for controlling electroplating operations.

FLOOR LOCKS AND HOISTS.—Bulletins 83 C and 83 D issued by the Revolvator Company, 336 Garfield Avenue, Jersey City, N. J., describe and illustrate its different types of floor locks and its electrically arc welded hoists.

CONDUIT FITTINGS AND FLEXIBLE FIXTURE HANGERS.—The Crouse-Hinds Company, Syracuse, N. Y., has issued bulletin G-9, describing its various types of groundulets. Illustrations are given showing a few applications of the groundulets. The company also is distributing bulletin No. 2125, which supersedes bulletin No. 2102, covering its different types of flexible fixture hangers.

POLYPHASE SWITCHES. — The Colt's Patent Fire Arms Manufacturing Company, Hartford, Conn., is distributing a catalog covering the "Noark" quadbreak polyphase switches for meter service and service entrance.

GAS-ENGINE-DRIVEN COMPRESSOR. —Bulletin No. 3149 issued by the Ingersoll-Rand Company, 11 Broadway, New York City, covers its type XG direct-connected, gas-engine-driven compressor. It contains illustrations and describes the construction of all of the parts of the compressor.

EARTH-BORING MACHINES. — The Highway Trailer Company, Edgerton, Wis., has issued a catalog describing its "Highway" earth-boring machines and pole-setting equipment. The catalog contains many illustrations and shows the operation of the machines with truck and tractor mounted.

CONNECTORS. — Bulletin No. 38-CB, issued by the Delta-Star Electric Company, 2400 Block, Fulton Street, Chicago, describes and illustrates its "Sumpter" compression type connectors for use on distribution transformers and other types of equipment.